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SALMON ON THE SPAWNING BEDS.

DEPARTMENT OF COMMERCE
BUREAU OF FISHERIES
HUGH M. SMITH, Commissioner

PACIFIC SALMON FISHERIES

By John N. Cobb

APPENDIX III TO THE REPORT OF U. S. COMMISSIONER
OF FISHERIES FOR 1916

Bureau of Fisheries Document No. 839

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PACIFIC SALMON FISHERIES.

By John N. Cobb.

INTRODUCTION.

The most valuable commercial fisheries in the world, excepting only the oyster and herring fisheries, are those supported by the salmons. Of these the most important by far are the salmon fisheries of the Pacific coast of North America, where California, Oregon, Washington, and Alaska, including also British Columbia, possess industries representing millions of dollars of investment and millions of output annually. In Siberia the fishery is increasing in importance annually as means of transportation become better, while Japan is also becoming a large factor in the salmon markets of the world through her investments in the salmon fisheries of Siberia and, to a lesser extent, through fisheries prosecuted in her own waters.

In this revised report[a] considerable new material has been added, while some of the chapters have been entirely remodeled and materially enlarged. The statistical data have been brought up to January 1, 1916.

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[a] The salmon fisheries of the Pacific coast. By John N. Cobb. Bureau of Fisheries document no. 751, 180 p. 1911.

I. THE SPECIES OF SALMON AND THE RUNS.

The Pacific coast salmons are all included in the genus *Oncorhynchus*. With them the fishermen incorrectly class the steelhead trout, which really belongs to the closely related genus *Salmo*.

As long ago as 1731 the species of *Oncorhynchus* were first made known by Steller, who, almost simultaneously with Krascheninikov, another early investigator, distinguished them with perfect accuracy under their Russian vernacular names. In 1792 Walbaum adopted these vernacular names in a scientific nomenclature for these fishes.

Five species of salmon (*Oncorhynchus*) are found in the waters of the north Pacific, ranging northward from Monterey Bay on the American coast and Japan on the Asiatic, the extreme northern distribution of certain of the species having not yet been accurately determined. The five species are: (1) *Oncorhynchus tschawytscha*, quinnat, tyee, chinook, spring, or king salmon; (2) *Oncorhynchus nerka*, blueback, red, sukkegh, or sockeye salmon; (3) *Oncorhynchus kisutch*, silver, coho, or white salmon; (4) *Oncorhynchus keta*, dog, keta, or chum salmon; and (5) *Oncorhynchus gorbuscha*, humpback or pink salmon.

CHINOOK, QUINNAT, OR KING SALMON.

The largest, best known, and most valuable of these is the chinook or king salmon (*O. tschawytscha*). It is found throughout the region from the Ventura River, Cal., to Norton Sound, Alaska, and on the Asiatic coast as far south as northern China. As knowledge extends, it will probably be recorded in the Arctic.

In the spring the body is silvery, the back, dorsal fin, and caudal fin having more or less of round black spots, and the sides of the head having a peculiar tin-colored metallic luster. In the fall the color is, in some places, black or dirty red. The fish has an average weight of about 22 pounds, but individuals weighing 70 to over 100 pounds are occasionally taken. One was caught near Klawak, Alaska, in 1909 which weighed 101 pounds without the head. The Yukon River is supposed to produce the finest examples, although this supposition is not based on very reliable observations. The southeast Alaska fish average as high as 23 pounds in certain seasons, followed by an average of about 22 pounds in the Columbia River and about 16 pounds in the Sacramento.

In most places the flesh is of a deep salmon red, but in certain places, notably southeast Alaska, Puget Sound, and British Columbia,

PLATE II.

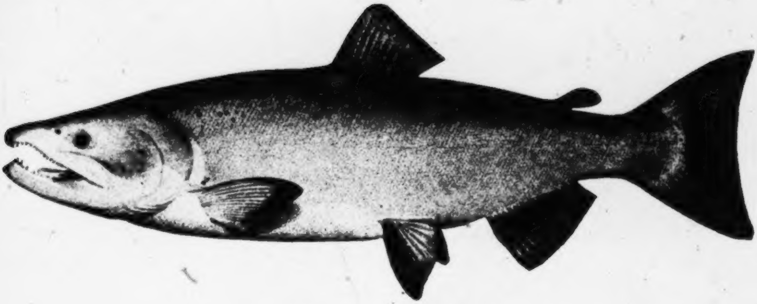

FIG. 1.—CHINOOK SALMON. BREEDING MALE.

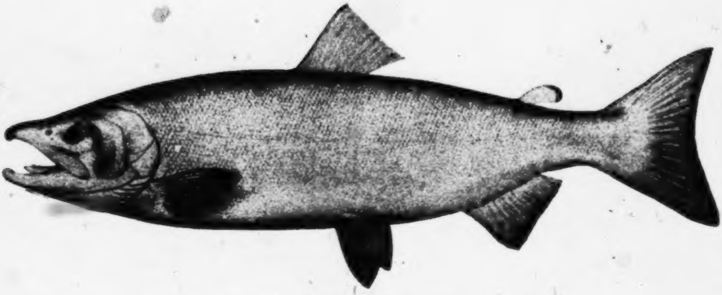

FIG. 2.—SOCKEYE SALMON. ADULT MALE.

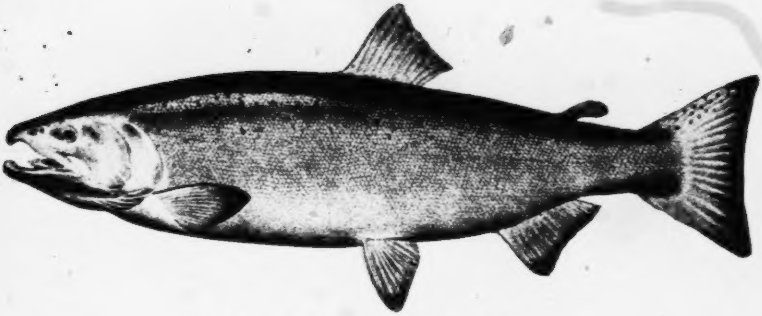

FIG. 3.—SILVER SALMON. BREEDING MALE.

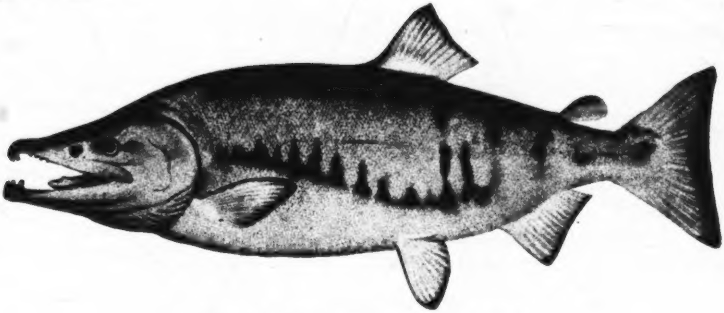

FIG. 1.—CHUM SALMON. BREEDING MALE.

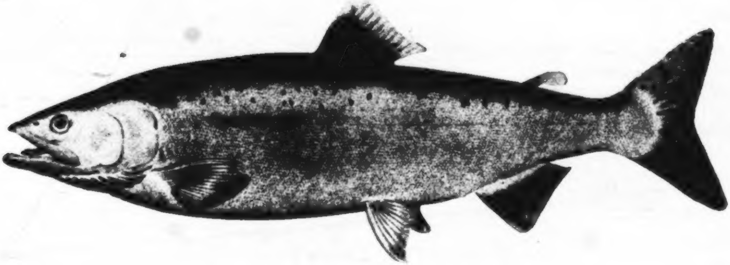

FIG 2.—HUMPBACK SALMON. ADULT MALE.

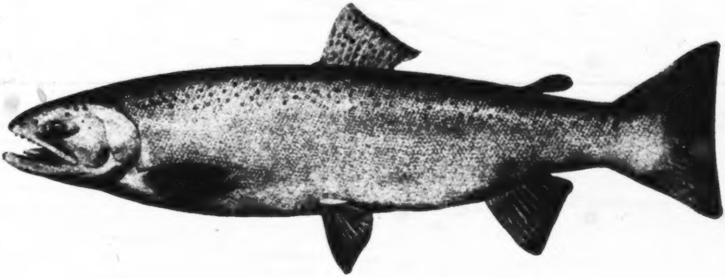

FIG. 3.—STEELHEAD TROUT.

many of the fish, the proportion being sometimes as much as one-third of the catch, have white flesh. A few examples have been taken with one side of the body red and the other white, while some are found with mottled flesh. No reasonable explanation of this phenomenon has yet been given.

In its southern range the quinnat strikes in at Monterey Bay in sufficient numbers to justify commercial fishing about the middle of April, where it is seen feeding upon the inshore moving schools of herring and sardines, continuing until in August. There are two runs of spawning fish in the Sacramento, the first or "spring run" beginning in April and continuing throughout May and June, these fish spawning mainly in the cold tributaries of the Sacramento, such as the McCloud and Fall Rivers. The second or "fall run" occurs in August, September, and October, and these fish spawn in the riffles in the main river between Tehama and Redding, also entering the tributaries in that vicinity. The two runs merge into each other. It is also claimed that there is a third run which comes in December.

In former years the San Joaquin and the American and Feather Rivers of the Sacramento system had large runs of salmon, but excessive fishing and the operation of various mining and irrigation projects have practically depleted them.

The Eel and Mad Rivers of northern California have only a late or fall run, while the Klamath River has both a spring and a fall run, and Smith River has a spring run alone. Rogue River in Oregon has both a spring and a fall run, and the Umpqua and several other coast streams of Oregon have small early runs.

The Columbia River has three runs, the first entering during January, February, and March, and spawning mainly in the Clackamas and neighboring streams. The second, which is the best run, enters during May, June, and part of July, spawning mainly in the headwaters. The third run occurs during late July, August, September, and part of October, and spawns in the tributaries of the lower Columbia.

In Puget Sound chinook salmon are found throughout the year, although it is only during the spawning season that they are very abundant. In the Fraser River, a tributary of the Sound, the run occurs from March to August.

In the Skeena River, British Columbia, the run occurs from May to July, the same being approximately true of the Nass also.

In Southeast Alaska they are found all months of the year. From March to the middle of June they are abundant and feeding in the numerous straits and sounds; in May and June the spawning fish enter the Unuk, Stikine, Taku, Chilkat, Alsek, and Copper Rivers in large numbers, and in a few smaller streams in lesser abundance. In August, September, and October they are again to be found in large numbers feeding in the bays and sounds, while during the winter months a few have been taken on trawls set for halibut, showing that they are living in the lower depths at this time.

In Cook Inlet the run occurs during May and June and is composed wholly of red-meated fish; in the rivers of Bristol Bay the run comes in May and June, and the same is true of the Togiak, Kuskokwim, and Yukon Rivers, although fish may be seen in the upper courses of the Yukon in July, the lateness here being due to the immense distance the fish have to cover.

SOCKEYE, BLUEBACK, OR RED SALMON.

The sockeye or blueback salmon (*O. nerka*), which forms the greatest part of the canned salmon of the world, when it first comes in from the sea is a clear bright blue above in color, silvery below. Soon after entering the river for the purpose of spawning the color of the head changes to a rich olive, the back and sides to crimson and finally to a dark blood red, and the belly to a dirty white. The maximum weight is about 12 pounds, and length 3 feet, with the average weight about 5 pounds, varying greatly, however, in different localities. Observations of Chamberlain[a] in Alaska show that the average weight of a number of sockeyes taken from Yes Bay was 8.294 pounds, while the average weight of a number from Tamgas was only 3.934 pounds. Evermann and Goldsborough[b] report as a result of the weighings of 1,390 red salmon, taken from as many different places in Alaska as possible, an average weight for the males of 7.43 pounds; for the females, 5.78 pounds; or an average weight for both sexes of 6.57 pounds. A run of small, or dwarf, males accompanies certain of the main runs, these being especially noticeable in the Chignik Lagoon, Alaska, run. This species usually enters streams with accessible lakes in their courses.

These fish are occasionally found landlocked in certain lakes, especially in the State of Washington, and are always much smaller in size than the sea-run fish. In Bumping Lake, near North Yakima, Wash., they are quite abundant and are mature when about a pound in weight. Despite the fact that these fish have a soft mouth, anglers consider them very gamey. They take bait, the fly, and the trolling spoon.

A few specimens of the sockeye have been taken as far south as the Sacramento River. In Humboldt County, Cal., small runs are said to occur in Mad and Eel Rivers. Only an occasional specimen appears in the coastal streams of Oregon. The Columbia is the most southern river in which this species is known to run in any considerable numbers, entering the river with the spring run of chinooks. From here south the species is called blueback exclusively. A considerable run enters the Quinault River, Wash., and there is also a small run in Ozette Lake, just south of Cape Flattery.

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[a] Some observations on salmon and trout in Alaska. By F. M. Chamberlain, naturalist, U. S. Fisheries steamer *Albatross*. U. S. Bureau of Fisheries Document no. 627, p. 80.

[b] The fishes of Alaska. By B. W. Evermann and E. L. Goldsborough. Bulletin Bureau of Fisheries, vol. XXVI, p. 267.

In the Puget Sound region, where it is known as the sockeye, this species ascends only the Skagit River in commercial numbers, although a small run appears in the Lake Washington system of lakes and, possibly, in the Snohomish, Stillaguamish, and Nooksack Rivers.

The greatest of all the sockeye streams is the Fraser River, British Columbia, and this stream has been famous from very early days for its enormous runs of this species, a peculiar feature of which is that there is a marked quadrennial periodicity in the run. The maximum run occurs the year following leap year, the minimum on the year following that. The greater part of the catch of the Puget Sound fishermen is made from this run as it is passing through Washington waters on its way to the Fraser. The fish strike in during July and August on the southwest coast of Vancouver Island, apparently coming from the open sea to the northwest. They pass the Straits of Juan de Fuca, Rosario, and Georgia, spending considerable time in the passage and about the mouth of the river. Small numbers run as early as May and as late as October, but the main body enters about the first week in August.

The sockeye occurs in most of the coastal streams of British Columbia, and is usually the most abundant species. The principal streams frequented are the Skeena, Rivers Inlet, Nass, Lowe Inlet, Dean Channel, Namu Harbor, Bella Coola, Smith Inlet, Alert Bay, and Alberni Canal.

In Alaska, where this fish is generally known as the red salmon, it is abundant and runs in great numbers in all suitable streams, of which, in southeast Alaska, the following are the most important: Boca de Quadra, Naha, Yes Bay, Thorne Bay, Karta Bay, Nowiskay, Peter Johnson, Hessa, Hetta, Hunter Bay, Klawak, Redfish Bay, Stikine, Taku, Chilkoot, Chilkat, Alsek, Situk, Ankow, etc.; in central Alaska, Copper, Knik, Kenai, Susitna, Afognak, Karluk, Alitak, Chignik; in the Bristol Bay region, the Ugashik, Ugaguk, Naknek, Kvichak, Nushagak, and Wood. It also occurs in the Togiak, Kuskokwim, and Yukon Rivers, which debouch into Bering Sea, and probably occurs in the Arctic streams of Alaska. The run in western Alaska begins usually early in June and extends generally to the early part of August. It begins earlier in Prince William Sound, however, and sometimes extends into September in southeast Alaska. The duration of the run averages about the same in each section.

SILVER OR COHO SALMON.

The silver or coho salmon (*O. kisutch*) is silvery in spring, greenish on the upper parts, where there are a few faint black spots. In the fall the males are mostly of a dirty red. The flesh in this species is of excellent flavor, but paler in color than the red salmon, and hence less valued for canning purposes.

This species has a maximum weight of about 30 pounds, with a general average of about 6 pounds.

The silver salmon is found as far south as Monterey Bay, where it appears during the month of July and is taken by the trollers. From Eel River, in California, north, it is found in most of the coastal streams. It usually appears in July and runs as late as November, the time of appearance and disappearance varying somewhat in different sections. Owing to its late appearance comparatively few, and they usually in the early part of the season, are packed by the canneries, most of which shut down in July and August. This fish also tarries but a short time about the mouth of the stream it is to enter, and is wary of nets, which makes it rather unprofitable to fish for the latter part of the season when it is running alone.

HUMPBACK OR PINK SALMON.

The humpback or pink salmon (*O. gorbuscha*) is the smallest of the American species, weighing from 3 to 11 pounds, the average being about 4 pounds. In color it is bluish above, silvery below, the posterior and upper parts with many round black spots, the caudal fin always having a few large black spots, oblong in shape. The males in fall are dirty red and are very much distorted in shape, a decided hump appearing on the back, from which deformity the species acquires its name. The flesh is softer than in the other species; it is pale in color, hence its canned name, "pink" salmon.

The southern limit of the fish is the Sacramento River, but only occasional specimens are found here and in the rivers to the northward until Puget Sound is reached. Here a large run appears every other year, the only place on the coast where such is the case.

The humpback occurs in varying abundance in the waters of British Columbia, but it is in the waters of southeast Alaska that it appears in its greatest abundance. Many of the canneries in this region depend mainly upon the humpback for their season's pack, and the canned product now occupies an excellent position in the markets of the world. The fish spawn in nearly all of the small, short streams.

In central and western Alaska the runs are much smaller and the humpback is not much sought after by the cannery men, who are usually able to fill their cans with the more valuable species.

In southeast Alaska the run begins in June and continues until September, or even later in some places. In western Alaska the period is somewhat shorter. In Puget Sound it continues until late in the fall.

CHUM OR KETA SALMON.

The chum or keta salmon (*O. keta*) reaches a maximum weight of 16 pounds, the average being about 8 pounds. When it first appears along the coast it is dirty silvery, immaculate or sprinkled with small black specks, the fins dusky, the sides with faint traces of gridironlike bars. Later in the season the male is brick red or blackish, and its jaws are greatly distorted. Its flesh is quite pale, especially when canned. It is especially good for freezing, salting, and smoking.

This species has a wide distribution. It is found as far south as San Francisco, but is not utilized commercially in California except on Eel River. It is found in most of the coastal streams from here north, being especially abundant from Puget Sound northward to southeast Alaska, both inclusive. In this region it is being utilized in greater abundance each year, as the market for it widens.

In central, western, and arctic Alaska the species occurs in varying abundance, but is utilized sparingly, except by the natives, with whom it is the favorite species dried for winter food.

The run of chum salmon comes later than that of any other species except the coho. In Alaska it begins in June, but the height of the season does not occur until late in August or early in September, and fish are found as late as November. In Puget Sound they run from about the middle of August till late in November, and practically the same is true in the Columbia River.

STEELHEAD TROUT.

The steelhead trout (*Salmo gairdneri*) is commonly classed as one of the salmons by the fishermen of the Pacific coast, and it has been included in this report on this account. In different localities the average weight is placed at from 8 to 15 pounds, while extreme sizes reach 45 pounds. The excellent quality of its flesh causes it to be highly prized for the fresh and frozen markets, but owing to its pale color only limited quantities are canned.

The principal center of abundance of this species is the Columbia River. It is found from Carmel River, Cal., north to central Alaska, and possibly has an even wider range in Alaska. It seems to be found in the rivers during the greater part of the year. In the Columbia River the spawning season is from February to May, in Puget Sound in the spring, and in southeast Alaska in May and June. The best commercial fishing is in January, February, and March. In California the catching of this species is restricted to hook and line fishing.

AGE OF SALMON AT MATURITY.

As practically all salmon which have the opportunity spawn but once and then die, knowledge of the age at which this occurs is of great interest both from an economic and scientific standpoint. Many attempts have been made to solve the problem with the sockeye and king salmon, the most important commercially of the five species, by means of marking artificially reared fry, usually by clipping one of their fins before they are liberated, as noted elsewhere in this report, but with unsatisfactory results.

Fortunately, certain experiments carried on in Tomales Bay, Cal., and in New Zealand, where king fry were planted in streams not frequented by the species in question and the return of the adults noted, have yielded some interesting and accurate information on the subject. These indicated that the age was four or more years, as no run was reported until the fourth year.

A more certain method of determining the age of salmon has been developed in recent years through the adaptation by American scientists of the discovery by European investigators that the ridges observed on the scales of certain fishes indicated a period of growth of the animal itself.

Dr. Charles H. Gilbert, of Stanford University, as early as 1910, applied this method to the determination of the age of the various species of Pacific salmon. As to its application to the Pacific salmon and the general method followed, Dr. Gilbert has the following to say:

> While the method is new as regards Pacific salmon, it has been experimentally tested and fully approved by the Fisheries Board of Scotland in the case of the Atlantic salmon, and is now universally accepted as furnishing reliable data as to the age and many other facts in the life history of that fish. It has been shown to be applicable also to various species of trout, and its value has been demonstrated in fishes as widely divergent as the carp, the eel, the bass, the flounder, and the cod. Descriptions of this scale structure and its significance have appeared in a large number of papers, both scientific and popular. It will suffice here to repeat that the scale in general persists throughout life, and grows in proportion with the rest of the fish, principally by additions around its border. At intervals there is produced at the growing edge a delicate ridge upon the surface of the scale, the successive ridges thus formed being concentric and subcircular in contour, each representing the outline of the scale at a certain period in its development. Many of these ridges are formed in the course of a year's growth, the number varying so widely in different individuals and during successive years in the history of the same individual that number alone can not be depended on to determine age. For this purpose we rely upon the fact that the fish grows at widely different rates during different seasons of the year, spring-summer being a period of rapid growth and fall-winter a season when growth is greatly retarded or almost wholly arrested. During the period of rapid growth the ridges are widely separated, while during the slow growth of fall and winter the ridges are crowded closely together, forming a dense band. Thus it comes that the surface of the scale is mapped out in a definite succession of areas, a band of widely spaced rings always followed by a band of closely crowded rings, the two together constituting a single year's growth. That irregularities occur will not be denied, and this is natural, inasmuch as growth may be checked by other causes than the purely seasonal one. Also a considerable experience is requisite for the correct interpretation in many cases, and a small residue of doubtful significance has always remained. This element is too small to affect the general results, and further investigation will almost certainly eliminate the doubtful cases altogether.[a]

---

[a] Age at maturity of the Pacific coast salmon of the genus *Oncorhynchus*. By Charles H. Gilbert. Bulletin U. S. Bureau of Fisheries, vol. XXXII, p. 4, 5.

As a result of his investigations up to this point, Dr. Gilbert presented the following conclusions drawn from the data collected:

1. The sockeye spawns normally either in its fourth or fifth year, the king salmon in its fourth, fifth, sixth, or seventh year, the females of both species being preponderatingly 4-year fish.

2. The young of both sockeye and king salmon may migrate seaward shortly after hatching, or may reside in fresh water until their second spring. Those of the first type grow more rapidly than the second, but are subject to greater dangers and develop proportionately fewer adults.

3. Coho salmon spawn normally only in their third year. The young migrate either as fry or yearlings, but adults are developed almost exclusively from those which migrate as yearlings.

4. Dog salmon mature normally either in their third, fourth, or fifth years, the humpback always in their second year. The young of both species pass to sea as soon as they are free swimming.

5. The term "grilse," as used for Pacific salmon, signifies conspicuously undersized fish which sparingly accompany the spawning run. They are precociously developed in advance of the normal spawning period of the species. So far as known, the grilse of the king salmon, coho, and dog salmon are exclusively males; of the sockeye, almost exclusively males, except in the Columbia River, where both sexes are about equally represented. The larger grilse meet or overlap in size the smaller of those individuals which mature one year later at the normal period.

6. Grilse of the sockeye are in their third year, of the king salmon in their second or third year, of the coho and the dog salmon in their second year.

7. The great differences in size among individuals of a species observed in the spawning run are closely correlated with age, the younger fish averaging constantly smaller than those one year older, though the curves of the two may overlap.[a]

Since 1910 Dr. Gilbert has devoted much of his time to investigations[b] along this line, especially on the sockeye, with most interesting and valuable results.

His observations on the sockeye runs of British Columbia indicate that they consist principally of four and five year fish and that these two classes appear during successive seasons in widely differing proportions; that each stream has its distinctive race of sockeye, the progeny returning at maturity to the parent stream; that sockeye fry rarely survive when they proceed to sea within the year in which they are hatched; and that sea feeding, with the consequent rapid growth, is the most important factor in producing early maturity, an equal number of years in fresh water producing comparatively little effect.

MARKING SALMON.

A favorite recreation for quite a number of Pacific coast people has been the marking of salmon fry in order to find out the age at which they return to spawn, the rate of growth, etc. Scattered through the reports of the various State fish commissions, and occasionally in the reports of the United States Bureau of Fisheries, are to be found detailed reports of such markings and the sometimes remarkable results attained, apparently, at varying periods subsequent to the marking.

---

[a] Ibid., p. 21, 22.

[b] Contributions to the life history of the sockeye salmon. (No. 1.) By C. H. Gilbert. Report of British Columbia Commissioner of Fisheries for the year ended Dec. 31, 1913, with appendixes, p. R53-78. Contributions to the life history of the sockeye salmon. (No. 2.) By C. H. Gilbert. Report British Columbia Commissioner of Fisheries for the year ended Dec. 31, 1914, with appendixes, p. N45-75.

All sorts of marks were employed. The favorite was the removal of the adipose fin, the experimenters appearing to be of the belief that the fish would miss this the least of any. However, the entire or partial removal of nearly every fin was practiced by some one or other of the many experimenters. Sometimes a V or a U was punched out of the tail or the gill cover, and in one or two instances a tag was employed.

In time these marking experiments became so numerous, and so imperfect a record was kept of them by any central authority, that frequently it was impossible to tell, when an apparently marked specimen was obtained, where and when it was marked, and as a result but little dependence could have been placed upon them even had there been no other factors conspiring to vitiate their value.

Fishermen are continually finding in their nets salmon which they feel sure have been marked by some hatchery. Scores of times in the course of his various investigations of the fisheries of this coast the writer has been told of or shown specimens which the fishermen thought had been marked. Many of these marks were on the side of the fish and represented an M or W, depending upon the angle from which viewed, and it was impossible, generally, to convince the fishermen that this mark was caused by the twine of his gill net pressing on the side of the fish. The obvious fact that a fish could not survive when in the fry stage the infliction of such a mark did not occur to them.

Frequently the scars left by the suctorial organs of the lamprey eel have been mistakenly supposed to be hatchery marks.

One of the most interesting cases of salmon marking, and one which drives home the necessity for accepting reports of returns from such markings with extreme caution, is that of F. M. Chamberlain, then naturalist of the Bureau of Fisheries steamer *Albatross*, on the Naha Stream in Alaska.

In August, 1903, 1,600 red salmon fry, reared for the purpose from the 1902 eggs, at the Fortmann hatchery of the Alaska Packers Association, near Loring, Alaska, were marked by Mr. Chamberlain by excising both ventrals with fine curved scissors. The fry were released in the Naha River as soon as marked, at which time they were about three months old.

In 1906 between 50 and 100 adult reds with ventral fins missing were reported by the superintendent of the hatchery at Yes Lake, which is located on the northern side of Behm Canal (Naha being on the southern side) and some 15 miles farther up the canal than the mouth of Naha Stream. Some of these also had the adipose removed, this mark having also been used on some of the fry. At the Fortmann hatchery, where they were marked, only two of these fish were obtained in 1906.

From then on until 1912, a period of 9½ years, the return of a number of these supposedly marked fish is noted each year at the two hatcheries in question, the number reported in the last-named year being larger than in some of the intervening years. In the latter year Mr. Chamberlain himself pointed out the impossibility of these all being from the fry he had marked and no further attention was paid to them.

The principal thing that this and some of the other many experiments in salmon marking prove is that the percentage of salmon which accidentally lose, either through disease or the attacks of their many enemies, one or more of their fins, or portions of same, is much larger than most people suppose. Out of the many millions taken annually in commercial and fish-cultural operations it is not surprising that some should be minus such exposed portions of their anatomy and this percentage would doubtless be found to be considerable were particular attention directed toward it. As it is now, it is only occasionally that the fisherman notices such loss, or mentions the same when he does, unless his attention has been directed to it by particular inquiry. In the Chamberlain experiment, for instance, after 1907 considerable publicity was given to the search for such marked fish, and the writer, in his travels through southeast Alaska during the succeeding years until the end of 1911, frequently was told by fishermen that they had caught salmon with missing fins. Inquiry developed that while a few of the lost fins were the same as Chamberlain had excised, a number were entirely different fins, showing that when the attention of fishermen was directed especially in this line many deformed fish would be found.

The confusion resulting from the many marking experiments carried on by different people shows the absolute necessity of some central authority regulating them if any real results are to be achieved from this line of endeavor. In 1908 the Secretary of Commerce, under authority of sections 11 and 12 of the Alaska fisheries law, directed that any persons desiring to mark and release salmon in Alaska first consult with and secure the written consent of the Commissioner of Fisheries or of the agent at the salmon fisheries of Alaska. It would be an excellent thing if some such control could also be exercised over these operations in the coastal States.

During the year 1916 Dr. Charles H. Gilbert, of Stanford University, assisted by Willis H. Rich, conducted salmon-marking experiments on an extensive scale. Late in the fall of 1915 a consignment of 100,000 eggs of the red salmon was forwarded to Seattle, Wash., from the station of the Bureau of Fisheries at Yes Bay, Alaska, of which 50,000 were reshipped to the Anderson Lake hatchery of the British Columbia Fisheries Department, located on the ocean side of Vancouver Island. The remaining 50,000 were sent to the Bureau of Fisheries hatchery at Quinault Lake, on the coast of Washington. The intention was as soon as the fry, hatched from these eggs, had developed into fingerlings to mark each lot with a distinctive marking and plant them in waters near the hatcheries, with the object of proving that the adult fish would return to the stream in which they had passed their early existence, no matter where the eggs were taken.

This plan could not be carried out at Anderson Lake, as the young fish resulting from the eggs, which were sent there, were not strong enough to survive the experiment. They were therefore liberated without marking. Those hatched at Quinault Lake were marked, however, and liberated in the summer of 1916. Dr. Gilbert has strong hopes that upon the return of the marked fish important data relating to the life history of the species will be obtained.

OCEAN HOME OF THE SALMON.

All sorts of conjectures have been hazarded as to the ocean home of the salmon after the young fish have gone to sea and disappeared apparently from the ken of man. Many have conjured up visions of vast schools of adult salmon surging along the coast hundreds of miles seeking for some suitable river in which to spawn, explaining in this wise the variations in the seasonal runs in different sections. Others think the fish go out into the greater depths of the ocean and there hide from man until the spawning instinct leads them back to the coast and thence to the stream in which they were born.

Discoveries of recent years have quite altered this uncertainty, and we now are reasonably certain that the vast majority of the salmon are comparatively near our coast line, while others stay in the bays, straits, and sounds virtually all the time when not in the rivers.

Some years ago it was first noticed that king salmon would take the hook while in salt and brackish waters. At first only the anglers were interested in this fact, but as the demand for king salmon for mild curing became more insistent the commercial fishermen, attracted by the high prices paid, began to devote some attention to the fish during the early spring months, and soon trolling became a recognized branch of the industry. It was first taken up on a considerable scale in southeast Alaska in 1905.[a] As the demand for the fish increased, the fishermen extended operations until almost all of southeast Alaska waters were being fished. The length of the fishing season was also increased until now only the severe weather of winter prevents them from fishing. However, the halibut trawls occasionally come up during the season with king salmon on them, showing that they are still on the ground.

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[a] Report on the fisheries of Alaska. By John N. Cobb. Bureau of Fisheries Document no. 618, p. 19-21.

The above is also true to a certain extent of the waters of British Columbia and Puget Sound and to a lesser extent, so far as has been disclosed, of Monterey Bay and the Oregon coast.

It has been known for some years that the silver, or coho, salmon would also take the hook under practically the same conditions as the king salmon, and the only reason this species has not been fished for to the same extent as the king has been because it was not large enough to be attractive to the mild curers, and hence there was a much lesser demand for it.

It had been supposed that the other species did not feed when in coastal waters, but Marsh and Cobb [a] state quite differently:

> Other species of salmon, in addition to the king, are found to take the trolling hook. For several weeks in July trollers in Union Bay, in southeast Alaska, caught a number of cohos and humpbacks while trolling for kings. The humpbacks were caught mainly with a spoon, no bait being used. Most of them appeared to have been feeding on needlefish and herring, according to the cutter who dressed them. A few red salmon are reported to have been caught on the trolling line by fishermen operating for king salmon in the neighborhood of Mary Island, near Dixon Entrance. Several fishermen report having in previous years frequently taken dog salmon on a hook in the bays along Chatham Strait.

In 1909, Mr. J. R. Heckman, of Ketchikan, Alaska, a well-known cannery man, told the writer that, while he was trying to install a floating trap near Cape Chacon, at the lower end of Prince of Wales Island, southeast Alaska, he on several occasions observed red salmon feeding on what he called a red shrimp.

This was also observed in 1912, when Dr. Gilbert reported, in connection with his observations of salmon fishing on Swiftsure Bank, off the Straits of San Juan de Fuca, that "during the past summer it was observed by Mr. J. P. Babcock and the writer that the sockeye on the bank were feeding extensively on a small shrimplike crustacean (*Thysanoessa spinifera*, Holmes), which floats in incredible numbers on the tides and forms a favorite food for the other species as well as for the sockeye." [b] He also found all the other species feeding voraciously in this neighborhood.

These observations would tend to confirm the belief which has been steadily growing in favor for some years that the salmon either spend the greater part of their life in the bays, straits, and sounds, or else in regions adjacent to the coast line.

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[a] The fisheries of Alaska in 1909. By Millard C. Marsh and John N. Cobb. U. S. Bureau of Fisheries. Document no. 730, p. 28.

[b] The salmon on Swiftsure Bank. By Charles H. Gilbert. Report of British Columbia Commissioner of Fisheries for year ending Dec. 31, 1912, p. 116.

The reason they had not been found in this region earlier is doubtless due to the fact that during the fall, winter, and spring months the weather on the north Pacific coast is such that fishing operations can not be carried on along the open coast, while in summer the fishermen are all busy on the spawning runs and have no time to devote to fish not yet arrived at maturity, which are probably feeding along the coast as usual.

II. FISHING GROUNDS AND HISTORY OF THE FISHERIES.*

WASHINGTON.

Puget Sound.—Strictly speaking, the name Puget Sound should be restricted to that long, narrow arm extending south from the Strait of Juan de Fuca, but a practice has developed, and is now common among fishermen and others, of designating all the great water area in the State of Washington comprising Puget Sound proper, Strait of Juan de Fuca, Canal de Haro, Rosario Strait, the Gulf of Georgia, and the smaller straits, bays, and sounds, as Puget Sound, and this practice, for the sake of convenience, has been followed in this report.

This great indentation in the coast, with its numerous islands and many fine harbors, has greatly aided the development of this portion of Washington and has been especially favorable to the prosecution of the salmon and other fisheries. Numerous rivers and creeks enter the Sound, the more important of these being on the eastern shore and comprising the Nooksack, Skagit, Stillaguamish, Snohomish, Duwamish, Puyallup, and Nisqually. On the southern and western shores the tributary streams are nearly all small, the more important being the Skokomish, Quilcene, Dungeness, and Elwha.

During the period when what is now the State of Washington was debatable ground between Great Britain and the United States, the Hudson Bay Co. annually salted considerable fish on Puget Sound and exported some to the Hawaiian Islands and Asia.

The first fishing operations by Americans were soon after the settlement at what is now known as Seattle, about 1852. For many years the catch was sold either fresh or salted, and the industry was small, as the population, for some years, was sparse. The extension of the railroad to Puget Sound, thus furnishing an outlet to the rapidly growing population in the Middle West, did much to aid the industry. This also gave opportunity to begin the shipping of fresh halibut and salmon to Eastern points. Ainsworth & Dunn, of Seattle, operating later under the name of the Seattle Fish Co., were the first successful pioneers in this branch of the industry, beginning about 1889, and carrying it on until they sold out in 1901, as noted later.

In 1903 the San Juan Fishing & Packing Co., which had begun the fresh-fish business in 1899, bought the business from the Pacific Packing & Navigation Co.

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* For some of the regions the historical data are fragmentary and can not be considered as other than historical notes. It is hoped that someone will write a history of the industry before all of the pioneers have passed away.

In 1897 the Chlopeck Fish Co. (now the Booth Fisheries Co.), which had been operating in Portland for several years, started a fresh fish and freezing business at Seattle.

The first salmon cannery on Puget Sound was erected by Jackson, Myers & Co., in 1877, at Mukilteo, in Snohomish County. The members of this firm had all been engaged previously in salmon canning on the Columbia River. The first pack was of 5,000 cases, composed wholly of silver, or coho, salmon. Later at this plant were put up the first humpbacks ever canned. In order to divert the minds of purchasers from the fact that the meat of the humpback was much lighter in color than the grades then known to the consuming public, the company printed on its label the legend, "Warranted not to turn red in the can." Even with this shrewd sizing up of the weak side of the consuming public the demand for humpback, or pink, salmon developed very slowly, and it was some years before it became a factor in the markets.

Within a year or two after the opening of the above plant another was started at Mukilteo by a man named Bigelow.

In 1880 the Myers' cannery was destroyed by a heavy fall of snow. It was rebuilt in West Seattle and was operated till 1888, when it was destroyed by fire. George T. Myers, now sole owner, built a new cannery at Milton, which was burned two years later, and he then came back to Seattle and built a cannery about where Ainsworth & Dunn's dock now stands. He remained here only one season, after which he moved to where the Pacific Coal Co.'s bunkers now are. Late in 1901 he sold out his plant to the United Fish Co., which company moved the plant to the foot of Connecticut Avenue, where they continued operations for two or three years and then quit.

In 1889 a man named Morse established a cannery at Seattle and operated it for only one year.

The first Puget Sound sockeye cannery was built at Semiahmoo, near Blaine, by J. A. Martin and John Elwood about 1887 or 1888. It was bought in 1892 for $500 by D. Drysdale, who shortly afterwards rebuilt and greatly enlarged the plant. In the same year Mr. Drysdale demonstrated the commercial success of fish traps. Traps had been in operation before this, however. In 1893 Ainsworth & Dunn had a trap at Five Mile Rock, just beyond the light house at Magnolia Bluff (now a part of Seattle), and there had been a trap or two in Elliott Bay even prior to this. Traps had not been profitable in this section, however, owing to the cheapness and abundance of salmon, haul seines being cheaper and more profitable to operate. A man named Kirby, who came originally from Nova Scotia, and another named Goodfellow (now living at Point Roberts) put in the first trap for Mr. Drysdale.

In 1893 A. E. Wadhams, who had operated on the Columbia River for some years, established a sockeye plant at Point Roberts.

In 1894 both canneries were sold to their present owner, the Alaska Packers Association, an organization formed not long before this by a combination of a number of Alaska plants.

In 1895 three new canneries were built at Anacortes—one by Philip S. Cook (later owned by the Porter Fish Co. and now by the Anacortes Fisheries Co.), one by the Anacortes Packing Co. (now owned by the Alaska Packers Association), and the other by the Fidalgo Island Canning Co.

In 1896 J. R. Young and B. L. Williams built a small cannery at Blaine. They failed in 1900 through the failure of their trap fishing and J. W. & V. Cook Packing Co., of Portland, bought their plant and put J. L. Smiley in charge of it. In 1909 Mr. Smiley purchased this plant from the company and has since operated it.

As Ainsworth & Dunn found that they were receiving more salmon than they could dispose of in a fresh condition (they were first, in 1889, to ship fresh salmon from here to eastern points), the firm built a cannery on the Seattle water front, at what is now Pier 8, about 1895 or 1896, and about 1897 built another at Blaine.

About 1898 A. E. Devlin came up from the Columbia River and established a plant at Friday Harbor, which is now operated by the Friday Harbor Packing Co.

In 1901 Ainsworth & Dunn sold all its fresh fish and canned salmon holdings to the newly organized Pacific Packing & Navigation Co. When the latter company failed and its assets were sold in 1904, the former firm bought back its Blaine plant and has operated it ever since. Mr. Ainsworth, the senior member of the firm, died in 1914, but the business is still operated under the name of Ainsworth & Dunn.

The Pacific American Fisheries Co. was incorporated in 1899. The company purchased at the time of its organization the cannery and trap properties of the Island Packing Co., San Juan Island, and the cannery of the Franco-American North Pacific Packing Co., at Fairhaven. The last-named cannery had been built the previous year.

By 1900 a number of canneries had been erected on the shores of Puget Sound, most of which were then in active operation. In 1901 the Pacific Packing & Navigation Co. was organized under the laws of the State of New Jersey, for the purpose of acquiring a number of salmon canneries on the coast. It was supposed to be backed by unlimited eastern capital, and its authorized capitalization was as follows: Common stock, $12,500,000; 7 per cent accumulative preferred stock, $12,500,000, and 6 per cent debentures, $7,000,000. It actually issued $6,037,000 common stock, $6,963,000 preferred stock, and $3,000,000 debentures. Subsequently the management effected an exchange of preferred stock for debentures, increasing the former to about $7,500,000 and decreasing the debentures to about $1,650,000.

The new company purchased a number of canneries in Alaska, also the following Puget Sound plants: Pacific American Fisheries Co.'s canneries at Fairhaven (now Bellingham) and Friday Harbor; the Ainsworth & Dunn canneries at Blaine and Seattle, and the Fairhaven Packing Co. cannery at Fairhaven.

The company had a very short career, ending up in the bankruptcy courts in 1903, and when all its affairs were wound up the stockholders received nothing, while the bondholders got but an exceedingly paltry sum out of all the money put into it.

Most of the canneries secured on Puget Sound were repurchased by their former owners or by new people.

From this time on the industry fluctuated considerably, 41 canneries, an increase of 10 over 1914, being operated in 1915.

During the early years of sockeye canning they were not sold to the trade as sockeyes, but as Alaska reds and Columbia River salmon, for which there had been an established market for some years.

H. Bell-Irving & Co., now of Vancouver, British Columbia, were the pioneers in the labeling of the fish as sockeyes, this being in 1894–95. Like all virtually new products, sockeye salmon had a hard fight for several years to secure a foothold in the salmon markets, and it was not until the Spanish-American war in 1898 caused a heavy demand for canned foods that its position became finally established.

Queets River.—This river, which is about 35 miles long, rises in the northern part of Jefferson County and empties directly into the ocean in the northwestern part of Chehalis County, within the bounds of the Quinault Indian Reservation. A small salmon cannery was built at Queets, in Jefferson County, in 1905.

Soleduck River.—This is a small stream, about 30 miles in length, which flows through the southwestern part of Clallam County and empties directly into the ocean. The Quillayute Indian Reservation is located here and the natives formerly caught salmon and marketed them on Puget Sound, but a small cannery, started at Mora, on this river, in 1912 and operated each season since, has furnished a market for the catch.

Quinault River.—This river, which enters the ocean in the northwestern part of Chehalis County, has a length from the ocean to Quinault Lake of about 40 miles, wholly within the boundaries of the Quinault Indian Reservation.

This stream is especially noted for its long-continued annual run of Quinault salmon (*O. nerka*). These fish, which are noted for their especially red-colored flesh, make their appearance early in

December, when the Indians generally catch them for their own use, as they fear that, if the whites got hold of the fish, they might throw away the hearts. Should a heart be eaten at this time by a dog or chicken, the Indians believe the run would not come. In January, when the fish begin to be abundant, all danger of this seems to have passed, for the Indians then usually have a considerable number for sale, and these are generally shipped to distant markets in a fresh condition by the buyers. As soon as the canneries open at Moclips most of the fish are disposed of at that place. The run continues up to July 1. May and June are the best fishing months.

There is a fall run of chinooks in this river, which usually arrives in August and ends about October 15.

The silver salmon appear about October 1 and the run is generally over by November 15; the dog salmon appear about November 1 and the run is usually over by the middle of the same month, while the steelhead trout run between November 20 and May 1. None of the latter are canned.

Moclips, the terminus of the railroad, is about 10 miles from the river, and the fish are all taken by team to this place. Twenty fish, weighing approximately 100 pounds, are put in each box, and these are piled onto the wagons until a load has been accumulated. The team owners get 50 cents a box for hauling the loaded ones to Moclips and 5 cents a box for bringing the empty ones back.

In 1915 the records of the Indian agent show that the Indians fishing on the north side of the river caught 219,654 Quinault salmon, valued at $49,820, while those on the south side caught 135,353 of these fish, valued at $30,528.60, or a grand total of 355,007 fish, valued at $80,348.60. This does not take into account the results of the fishing for the other species of salmon and steelhead trout, which quite materially swell the total.

Fishing is restricted to the Indians, who also make their own fishery laws, with the advice and approval of the Office of Indian Affairs, as the State laws have no force inside the bounds of the reservation. Under the regulations now in force, a clear channel of one-third the width must be left in the middle of the stream, which is from 250 to 300 yards in width. Each owner of a fishing location has to fish it in person; provided, however, that widows, orphans, minor children, old Indians, and those who are sick or have other gainful occupations are allowed to lease their locations or hire some one to fish them, and then only with the approval of the officer in charge.

During the Quinault season stake nets are used, while the rest of the time, as a result of the freshets, drift gill nets are used in the eddies. The stake nets are arranged in a rather peculiar manner. A line of stakes is run out for about one-third the width at right angles to the shore, and to these are attached a net by short ropes. From each stake a section of net is run out and downstream, curving inward like a hook at the end, the latter part being held in place by three stakes.

The stake nets are 40 to 60 meshes deep, with 5¼-inch stretch mesh, and are set 85 yards apart. A set of these as described above forms one fishing location.

The chinook gill nets are usually 8¾ to 9 inches stretch mesh and 24 meshes deep, while the gill nets for silvers, chums, and steelheads are of 7-inch stretch mesh and 35 meshes deep.

For some years the salmon from the Quinault River were brought to Hoquiam and Aberdeen for canning. In 1911 W. W. Kurtz, of the former place, began the erection of a cannery at Moclips for the purpose of packing these fish, and the same season his example was followed by Frank Shafer. Mr. Kurtz still operates his plant, but the other is now owned by the Pacific Fisheries & Packing Co.

Grays Harbor.—This is the first important indentation on the coast of Washington south of Cape Flattery. It is about 40 miles long from east to west and about 20 miles wide in the widest part. The principal tributary is the Chehalis River, but there are a number of small streams which debouch into the harbor.

In 1883 B. A. Seaborg, who operated a cannery on the Columbia River, established a plant at what was later to be the thriving city of Aberdeen, although at that time it was practically a wilderness.

In 1902 the North American Fisheries Co. built a plant at Aberdeen. Shortly after it came into the possession of the Grays Harbor Packing Co., and on June 8, 1903, it was destroyed by fire. It was rebuilt and operated by this company until 1906, when it was sold to S. Elmore & Co., who still own it.

The Hoquiam Packing Co. built a cannery at Hoquiam in 1904 and have operated it ever since.

In 1910 two canneries were in operation at Aberdeen and Hoquiam, respectively, while in 1915 there were three at the former place and one at the latter in operation.

Willapa Harbor.—The entrance to this harbor, which also includes Shoalwater Bay, is about 27 miles south of Grays Harbor. The harbor runs east and west and is about 25 miles long. Shoalwater Bay extends south from it a distance of about 30 miles, its southern portion ending about a mile from the Columbia River and its western side being separated from the ocean by a spit varying in width from three-fourths to 1 mile. The bay is shallow, excepting in the main channel. The principal salmon streams entering the harbor are the Nasel and North Rivers, in which most of the pound or trap nets are located.

In 1884 B. A. Seaborg, a Columbia River canner, established a plant on Shoalwater Bay, as the whole of Willapa Harbor was then known.

About 1900 F. C. Barnes established a cannery at Sunshine, on the Nasel River, but the run of salmon on this river soon became so small that the plant was abandoned and the machinery moved to Mr. Barnes's cannery at South Bend.

In 1904 P. J. McGowan, the Columbia River canner, opened a cannery on the North River. Mr. McGowan, who was over 80 years of age at the time, had turned the control of his important Columbia River canning interests over to his sons, but finding idleness not to his liking, started this cannery in order to have something to occupy his time. He operated it for several years and then abandoned the project.

In 1912 the Chetlo Harbor Packing Co. established a cannery at Chetlo Harbor, but operated it only that year and in 1914.

In 1915 only two canneries, both of them at South Bend, operated on Willapa Harbor.

COLUMBIA RIVER.

The Columbia, which is the largest river of the Pacific coast, rises in British Columbia, flows through Washington, reaching the northern border of Oregon about 75 miles west of the State's eastern boundary; from this point the river forms the dividing line between Oregon and Washington, its general course being westerly. It empties into the Pacific at Cape Disappointment. Its principal tributaries are the Snake, John Day, Deschutes, and Willamette Rivers, and through these the main river drains an enormous extent of territory.

This river, which has produced more salmon than any other river in the world, has had a most interesting history. Many years before the white man saw its waters the Indians visited its banks during the annual salmon runs and caught and cured their winter's supply of food. Along the shores of the river at The Dalles for 15 miles were notable fisheries where various bands, who lived south and north, had their respective fishing locations, and to which all others were forbidden access. They used spears and dip nets in catching the salmon, the majority of which were dried and smoked for winter use.

A favorite preparation of the Indians who resorted to the river was pemmican. This was the meat of the salmon cleaned of the bones, pounded up fine, and then packed in hempen sacks of home manufacture. A sack of pemmican weighed from 80 to 90 pounds and was worth in barter as much as an ordinary horse.

It was about the year 1833 that a small trading sloop, under the command of Capt. Lamont, came into the Columbia River on one of her regular trips and dropped anchor near what is now known as St. Helens. While waiting several months for a return cargo the captain salted a number of barrels of chinook salmon, using old Jamaica rum kegs for the purpose. This is the first record of the export of this toothsome fish.

In 1861, H. N. Rice and Jotham Reed began packing salted salmon in barrels at Oak Point, 60 miles below Portland. The first season's pack amounted to 600 barrels. The venture proved fairly profitable and was soon participated in by others.

In the spring of 1866 William Hume, who had assisted in starting the first salmon cannery in the United States on the Sacramento River in 1864, finding the run of fish in the latter stream rather disappointing, started a cannery for Hapgood, Hume & Co. on the Columbia at Eagle Cliff, Wash., about 40 miles above Astoria.

The year this first cannery operated the following fishermen were operating in the river: Jotham Reed used a trap and a small gill net opposite Oak Point; Mr. Wallace fished a small seine from the shore of an island of that name a short distance below; John T. M. Harrington (who was later to establish the Pillar Rock cannery), in conjunction with a man named Fitzpatrick, operated a seine at Tenasillihe, as did also a Mr. Welch; P. J. McGowan, who, with his sons, in 1884 started a cannery at McGowan, and later, at Warrendale, Ilwaco, etc., operated two small seines at Chinook Beach; and Hapgood, Hume & Co. had two small gill nets about 125 fathoms in length and 32 meshes deep. The gill net of Mr. Reed was much smaller than these. At this period the river literally swarmed with salmon, and the cannery had no trouble in packing 4,000 cases, which it increased to 18,000 the next year and to 28,000 cases in 1868.

In 1867 a crude cannery on a scow was started by S. W. Aldrich, a ship carpenter. The scow was about 50 by 20 feet, with a cabin on it, and in one end of this he constructed a brick furnace in which he set a large cast-iron cauldron for a cooker. Along one side he rigged a bench and manufactured the cans. Aldrich was a regular jack-of-all-trades, as he did everything from catching the fish to canning and cooking them ready for the market.

In 1868 a cannery was built near Eagle Cliff by one of the Humes, while in 1873 R. D. Hume built another at Bay View, Wash. He operated it until 1876, when Mr. Leveridge, of Leveridge, Wadhams & Co., of San Francisco, bought it and operated it during 1877 and 1878. George W. Hume took it then and a few years later sold it to David Morgan, jr., who got into financial difficulties, and the plant was ordered sold by the court. C. W. Fulton, of Astoria, later a United States Senator, had the matter in charge, but was unable to find a customer, and finally in desperation, offered it to

W. H. Barker, of George & Barker, for $600. Mr. Fulton closed with him the same day. It proved a most profitable transaction for the purchasers, who acquired a million and a half labels which could be utilized, the machinery was taken out for other plants, the timber on the land belonging to the tract sold, and the floating property disposed of for a considerable sum, after which the stripped plant and land were sold back to Mr. Morgan for $600, the purchase price. He sold it to George W. Hume, who wanted it to correct a title. It was sold for taxes a couple of years later and was bought in by B. A. Seaborg, who operated it for two years, since when it has been idle.

George W. Hume was the first salmon canner to employ Chinese. This was at Eagle Cliff in 1872. At this period the white laborers in the canneries were recruited from the riff raff and criminal element of Portland. He had a Chinese working for him and through this Chinaman secured a Chinese gang from Portland. This labor proved so satisfactory that the custom soon spread to the other canneries. It was not found that the Chinese could do the work any better or quicker than the white laborers, but they proved more reliable in their work and gave less trouble.

Of the 35 canneries on the Columbia River in 1881, it is said that about one-half had been established by the Hume brothers. G. W. and William Hume were partners in the firm of Hapgood, Hume & Co., on the Sacramento River, and established the first cannery on the Columbia. In 1881 William was the proprietor of two canneries, one at Astoria, Oreg., and one at Eagle Cliff, Wash. R. D. Hume, a third brother, in the same year had a cannery in operation on the Rogue River, and established three others, one at Eagle Cliff (then owned by William Hume), one at Rainier (then belonging to Jackson & Myers), and one at Astoria. The fourth brother, Joseph, came to the coast in 1871 and some time later established a cannery on the river.

One of the pioneer canners on the river was the late F. M. Warren, operating as the Warren Packing Co., who established a cannery at Cathlamet, Wash., in 1869. The same company is still operating the plant. Later another cannery was established at Warrendale, Oreg., and both are still being operated by this company. Mr. Warren was the inventor of a retort, patented on April 10, 1877, which was in use by the principal canneries on the coast for a number of years.

John West was another pioneer. He built a cannery at Hungry Harbor, Wash., about 1869. In 1881 he moved his plant to Westport, on the Oregon side of the river. Mr. West was the inventor of a packing machine for placing the fish in the cans.

In 1871 the firm of Megler & Jewett established a cannery on the present site of Brookfield, Wash., and named it in honor of Mrs. Megler's birthplace, North Brookfield, Mass. In 1876 the plant was greatly enlarged and J. S. Megler bought out his partner and took in Mr. Macleay, of Corbett-Macleay, wholesale grocers, of Portland and San Francisco, and changed the firm name to J. S. Megler & Co., under which title it still operates. In 1879 Mr. Megler bought out this partner and owned the plant until his death in 1915, since when it has been operated by his widow.

The first soldering machine used on the Columbia River was in this plant, while the steam box and lacquering machines were first put in use on the river in this plant.

In 1874 the Adair brothers, S. D. and John, jr., erected a cannery at Astoria, the second one to be built there. Before packing began, A. Booth, the well-known Chicago fish dealer, and progenitor of the present Booth Fisheries Co., acquired a half interest in the plant, which was then named A. Booth & Co. John Adair, jr., was the manager. The brothers established canneries on the Fraser River and in some seasons exchanged places in operating on the two rivers. S. D. Adair sold out his cannery on the Fraser and bought one on the Columbia and operated it under the firm name of S. D. Adair & Co. After selling out his interest in A. Booth & Co., S. D. Adair formed a partnership with Wm. B. Adair under the style of S. D. Adair & Co. in 1881. The brothers were active in the industry for a number of years.

J. O. Hanthorn, under the firm name of J. O. Hanthorn & Co., established one of the largest canneries on the river at Astoria in 1876. Mr. Hanthorn invented a rotary can washer for washing cans after they were filled ready for soldering and before the tops were put on.

In the same year Marshall J. Kinney began his long and interesting career in the canning business by establishing a cannery at Astoria.

The first fish trap, or pound, on the river was constructed by Mr. Graham, in Baker Bay, on the Washington shore, in 1879. In 1881 P. J. McGowan built some traps just below the bay. The traps were very successful at times.

The first purse seine on the river was operated by William Graham & Co. in 1906.

Below appears a list of the canneries operated on the Columbia River in 1881, together with the pack of each during the year in question:

J. Williams (Oregon side)	9,000
Astoria Packing Co	30,000
Elmore Packing Co	7,800
Astoria Fishery (M. J. Kinney)	26,000
Wm. Hume	20,000
Geo. W. Hume	18,000
Devlin & Co	20,000
Occident Packing Co	15,000

West Coast	15,000
Badollet & Co.	25,000
Booth & Co.	23,000
Eagle Cannery	17,300
Timmins & Co.	8,000
Fishermen's Packing Co.	19,000
S. D. Adair & Co.	10,000
Anglo-American Packing Co.	10,300
Hanthorn & Co.	19,000
Scandinavian Co.	20,000
J. W. & V. Cook	30,000
F. M. Warren	12,000
J. West	12,000
Jackson & Myers (2 canneries)	13,000
Aberdeen Packing Co. (Washington Territory side)	17,000
Jos. Hume, Knappton	20,225
Pillar Rock Co.	15,000
J. G. Megler & Co.	25,000
Columbia Canning Co.	8,000
R. D. Hume & Co.	8,300
Cathlamet Cannery	8,000
Jas. Quinn	5,000
Cutting & Co.	20,000
Eureka Packing Co.	20,000
Hapgood & Co.	13,000
Eagle Cliff Cannery	10,000
Total	549,115

The banner year in the canning industry was 1884, when 620,000 cases of chinook salmon were marketed. At this time the runs were so enormous that tons and tons of salmon were thrown overboard by the fishermen because the canneries were unable to handle them.

As in other sections there came a time when the market began to be glutted by the packs of the numerous canneries, and it was found necessary to combine some of the plants in order to operate more cheaply and also to reduce the output.

In 1885 W. H. Barker and George H. George, who had been connected with various canneries, formed a partnership as George & Barker and purchased the Astoria cannery of the Port Adams Packing Co., then 2 years old.

Shortly before this a combination which was named the Eureka & Epicure Packing Co., had been formed and comprised the following plants: Knappton Packing Co., Knappton; North Shore Packing Co., just below Knappton; and the Eureka Packing Co. This combination got into financial difficulties and the reorganizers persuaded George & Barker to join the combination and take charge, which they did.

In 1897 the Eureka & Epicure Packing Co., the plants of Samuel Elmore, M. J. Kinney and J. W. Seaborg, all at Astoria; J. O. Hanthorn & Co., Astoria; Fishermen's Packing Co., Astoria; Scandinavian

Packing Co., Astoria; Columbia Canning Co., and J. W. & V. Cook, Clifton, were combined under the name of the Columbia River Packers Association. In 1890 the association built a new cannery at Rooster Rock. Mr George was with the association until his death, but Mr. Barker left it to become general manager of the British Columbia Packers Association where he is at present, the dean of the Pacific coast cannerymen.

At the present time (1915) there are 19 canneries in operation on the river, while large quantities of salmon are also frozen, mild cured, pickled, smoked, and sold fresh in the markets of the world.

Commercial fishing is carried on mainly between the mouth of the Columbia and Celilo, a distance of about 200 miles, and in the Willamette River. The most of it is in the lower part of the river, within about 40 miles of its mouth. Bakers Bay, on the Washington or north side, and just within the river's mouth, is the favorite ground for pound-net fishing. The principal gill-net drifting ground is from the river's mouth to about 20 miles above Astoria, but drifting is done wherever convenient reaches are found much farther up the river. Most of the drag seines are hauled on the sandy bars in the river near Astoria, which are uncovered at low water. Wheels are operated in the upper river above the junction of the Willamette with the main river.

Astoria is the principal center for all branches of the industry, but more especially for canning. Other places in addition to Astoria at which canneries are located are Ilwaco, Eagle Cliff, Altoona, Brookfield, Pillar Rock, and Cathlamet, on the Washington shore, and at Warrendale, Rooster Rock, and Seuferts, on the Oregon shore.

OREGON.

Necanicum Creek.—This short stream is in Clatsop County and enters the Pacific Ocean about 10 miles south of the Columbia River. Its fisheries are of small importance.

Nehalem River.—The Nehalem is a small coastal river that rises in the mountains of Clatsop and Columbia Counties, and flows into the Pacific Ocean in the northern part of Tillamook County. As early as 1887 there was a small cannery here, and the business has been followed ever since. In 1911 an additional plant was built and both have operated each year since, except in 1913, when one was shut down.

Tillamook Bay and River.—Tillamook River is a very short stream which enters Tillamook Bay, the latter being in Tillamook County and about 45 miles south of the mouth of the Columbia River.

Fishing is carried on mainly in the bay. The earliest record we have of canneries on this bay is of 1886, when two were in operation. From 1891 to 1910 but one was operated, but in 1911 another plant was started, and both have been operated each season since, except in 1913, when one was shut down.

Nestucca River.—This stream enters the ocean in the southwestern part of Tillamook County. A cannery operated here in 1887 and the business has been carried on each season with but one intermission since 1905.

Siletz River.—This river has its source in the mountains of Polk County and enters the ocean in the northern part of Lincoln County. The commercial development of the fisheries was hampered for many years owing to the fact that the river was within the boundaries of what was then the Siletz Indian Reservation. The first cannery was established here in 1896, and it has operated nearly every season since.

Yaquina Bay and River.—The Yaquina ("crooked") River is about 60 miles long; its general course is nearly west through the county of Benton. The river is narrow throughout the greater part of its length. A few miles from its mouth it suddenly broadens out into an estuary from one-half to three-fourths of a mile wide, which is commonly called Yaquina Bay. The river enters the Pacific about 100 miles south of the Columbia.

Salmon canning was begun on this river in 1887, when two small canneries were constructed. The next year an additional plant was erected. The business has fluctuated considerably since then and there is now but one cannery, which has not been operated since 1911.

The fishing grounds are all in the bay and the lower section of the river. The fishermen of this section are fortunate in that they have railroad communication with the outside world, the only place on the ocean side of Oregon, except Tillamook, so situated. In 1915 another railroad line from Eugene to the mouth of the Siuslaw River, at which point it connected with a line to the Coquille River, was opened for traffic.

Alsea Bay and River.—Alsea River rises in the southwestern part of Benton County, and flows in nearly a northwesterly direction to the Pacific, a distance of about 60 miles. Like the Yaquina, the "bay" is merely a broadening out of the river just inside its mouth.

The first cannery was established in 1886 and by 1888 there were three in operation. For many years but one was operated. In 1911 and each season since two canneries have been operated.

The best fishing grounds are from the mouth of the river to about 5 miles inland.

Siuslaw River.—This river has its source in the mountains of Lane County, and its course lies first in a northwesterly direction and then to the westward until the Pacific is reached. Through part of its course it is the dividing line between Lane and Douglas Counties.

As early as 1878 there were two canneries operated on this river, but from 1879 till 1888 there are no data available showing the extent of the fisheries. In 1896 A. W. Hurd built a cannery which was destroyed by fire in 1908. At present there are two canneries, but of recent years only one has been operated. The opening of a railroad line from Eugene to here, thus furnishing an outlet for fresh salmon shipments, will doubtless greatly help in developing its fisheries.

The salmon fishing grounds extend from near the mouth of the river to about 20 miles upstream.

Umpqua River.—With the exception of the Columbia this is the largest and longest river in Oregon. It is formed by north and south forks, which unite about 9 miles northwest of Roseburg, and the river then flows northwestwardly and enters the Pacific. Practically all of this river is within the boundaries of Douglas County, one of the largest counties in the State. A railroad has recently been built along this river and in time there will doubtless be a large development of the fisheries of this region owing to the opportunities which will be offered for shipping fresh fish.

With the exception of Rogue River, this is the only river in Oregon south of the Columbia River in which a spring run of chinook salmon occurs.

As early as 1878 there were two canneries located on the Umpqua, one of which was built by George W. Hume. The number has never been larger than this, and usually there has been but one operating. In 1912 there was but one, at Gardiner. In 1915 two were operated.

Coos Bay and River.—Coos Bay is a navigable semicircular inlet of the ocean with numerous arms or branches. There is much marshy ground in the bay, and a number of sloughs, or small creeks, which empty into the bay from both sides. Coos River proper is an unimportant stream, but a few miles in length. North Bend, Marshfield, and Empire are the principal towns on the Bay. A branch railroad is being built to these points from the main line of the Southern Pacific Railway, and as soon as this is completed the fishing industry will receive a great impetus. Heretofore this region has depended upon steamers and sailing vessels plying to Portland and San Francisco for its communication with the outside world, and this slow and infrequent means of shipment has very seriously handicapped the fisheries.

Salmon canning began here in 1887, when two canneries opened for business. The business has fluctuated considerably since, most of the time but one cannery being operated, and such being the case in 1915.

Fishing is carried on mainly in the bay. A few set nets are operated in the river.

Coquille River.—This river is formed by three branches, called the North, Middle, and South Forks, which rise in the Umpqua Mountains and unite near Myrtle Point, the head of tidewater, about 45 miles by river from the mouth of the stream. It is a deep and sluggish river, with no natural obstructions to hinder the free passage of fish. Its fisheries have been seriously hampered by the lack of railroad communication, but this has recently been remedied, as the railroad to Coos Bay connects with a short line now in existence between the Coquille River and Coos Bay, and thence on to the Siuslaw and from there to Eugene.

The principal towns on the Coquille River are Bandon, Prosper, Coquille, and Myrtle Point. Bandon is the shipping port.

Pickled salmon were cured and shipped from this river very early, the first recorded instance of any considerable quantity being in 1877, when 3,000 barrels of salmon were sent to San Francisco. The salt shipments were important until within recent years. The first salmon cannery was erected in 1883, at Parkersburg. In 1886 another was built at the same place, and the following year still another was erected close by. This was the largest number ever in operation in any one year. Since 1909 two canneries have been operated, both at Prosper.

The fishing grounds are from the mouth to Myrtle Point, about 45 miles inland.

Sixes River.—This small river is located in the northern part of Curry County, and is about 40 miles in length, entering the Pacific a very short distance above Cape Blanco. The salmon caught here are either salted or shipped fresh to the canneries on the Coquille River.

Elk River.—This is another small stream about 40 miles in length, which enters the Pacific just south of Cape Blanco. As on the Sixes River, the salmon are either salted or sold fresh to the canneries on the Coquille River.

Rogue River.—This river has as its source Crater Lake in the Cascade Mountains, on the western border of Klamath County, flowing a distance of about 325 miles to the ocean, which it enters at Wedderburn. Its principal tributaries are the Illinois, Applegate, and Stewart Rivers. Owing to canyons and falls in the main river between the mouth of the Illinois River and Hellgate, the latter near Hogan Creek, which runs through the town of Merlin, navigation and fishing are impossible in that section. Except at the mouth of the river the population is very sparse until about the neighborhood of Hogan Creek, where the river approaches the railroad, and from here on for some miles there are numerous growing towns.

Owing to the fact of there being both a spring and a fall run of salmon in this river, the fisheries early became of importance, although sadly hampered because of being compelled to depend wholly on vessel communication with San Francisco, many miles away. In the early years the salmon were pickled and shipped to San Francisco. In 1877 R. D. Hume, who had been canning salmon on the Columbia River, removed to the Rogue River, and established near the mouth a cannery which he operated every season (except 1894, when the cannery burned down) until his death in November, 1908, after which date it was operated by his heirs. Mr. Hume also operated a large cold-storage plant at Wedderburn for several years.

The development of the fisheries of the lower Rogue River was very much hampered by the monopoly which Mr. Hume acquired and maintained until his death. He bought both shores of the river for 12 miles from its mouth, and also owned an unbroken frontage on the ocean shore extending 7 miles north from the mouth of the river. As a result of this, independent fishermen could find no convenient places for landing, which was necessary in order to cure, handle, and ship the fish caught. Since Mr. Hume's death the property has been sold to the Macleay estate, but the people of Oregon, upon an initiative and referendum petition, voted in 1910 to close Rogue River to all commercial fishing, and it was so closed in 1911 and 1912, but reopened in 1913. A second cannery was built here in 1915 by B. A. Seaborg & Co.

In the upper river ranchers living along the banks have engaged in fishing for a number of years, the catch for the most part being sold fresh. In recent years, as the country has developed, this fishery has become fairly important.

Chetco and Windchuck Rivers.—These two unimportant streams empty into the Pacific in the lower part of Curry County, not far from the California line. The former is about 20 miles and the latter about 25 miles in length. Both have runs of salmon, and small fisheries have been maintained for some years, the catch being either pickled or sold to the California canneries.

CALIFORNIA.

Smith River.—This river, which is the most northerly one in the State, rises near the Siskiyou Mountains, and runs in a westerly direction to the Pacific Ocean.

The river has only a spring run of salmon, and the early recorded history of the fisheries is fragmentary. The pickling of salmon was the main business at first and has been important ever since, as the cannery, which was first established in 1878, operated irregularly, and seems to have shut down entirely in 1895. Canning began again in 1914 by H. E. Westbrook and continued in 1915.

Klamath River.—This is the most important river in California north of the Sacramento. It issues from the Lower Klamath Lake in Klamath County, Oreg., and runs southwesterly across Siskiyou County, passes through the southeastern section of Del Norte County, keeping its southerly course into Humboldt County, where it forms a junction with the Trinity River, and thence its course is directed to the northwest until it reaches the Pacific Ocean.

The Klamath River is important as a salmon stream because it has both a spring and fall run of salmon. In 1888 a cannery was established at Requa, at the mouth, and this has been operated occasionally ever since. The pickling of salmon has been done here for a number of years. Some years part of the catch has been shipped fresh to the cannery on Smith River or to the Rogue River (Oreg.) cannery. Since 1908 the cannery has been operated continuously by the Klamath River Packers Association.

Humboldt Bay and tributaries.—The shore line of Humboldt County is bold and high, except in the vicinity of Humboldt Bay, where it is rather flat. The latter is the only harbor along the county shore, and it is quite difficult of access, owing to the bar at the entrance, upon which the sea breaks quite heavily. The bay is about 12 miles long and about 3 miles wide. Mad River, which has its rise in the lower part of Trinity County, runs in a northwesterly direction, then makes a sharp turn and enters the bay from the north side. Eel River, which has its rise in Lake County, far to the southeast, runs in a northwesterly direction and enters the bay at its southern extremity. Small railroads running south from Eureka traverse the shores of both rivers for some miles. A railroad now runs from the north side of San Francisco Bay to Eureka, and it has aided very materially in extending the market for salmon caught in these rivers.

Mattole River.—This is a small and unimportant river in the southern part of Humboldt County, and is said to have a good run of salmon each year, but no commercial fishing has as yet been carried on here.

Some salmon fishing is now (1915) carried on at Fort Bragg, in Mendocino County. The Noyo River debouches into the ocean at this place. Shipping salmon from here is now possible, owing to a branch railroad having been built to the coast at this point. It is probable that, as other points in the region between San Francisco and Humboldt Bays are made accessible by the railroad, the salmon fishery will be expanded very considerably.

Sacramento and San Joaquin Rivers.—These two rivers are the most important in California. The Sacramento is quite crooked, the distance by river from Red Bluff to San Francisco being about 375 miles, while the distance by rail between these two places is only 225 miles. The river rises in several small lakes in the mountains about 20 miles west of Sisson, in Siskiyou County, and for nearly half its length flows through a narrow canyon. The upper portion is a typical mountain stream, with innumerable pools and rapids. A little above Redding the river emerges from the canyon and widens into a broad shallow stream. Below Sacramento it runs through a level country and is affected by tides. Sloughs are numerous in this stretch, some connecting it with the San Joaquin. The Sacramento and San Joaquin Rivers join as they empty into Suisun Bay.

The principal tributaries of the Sacramento which are frequented by salmon are the Pit and McCloud Rivers and Battle Creek. At one time salmon frequented the American and Feather Rivers, but mining and irrigation operations along these streams either killed them off or drove them away.

The San Joaquin River has its source in the Sierra Nevada Mountains. Flowing westerly and forming the boundary between Fresno and Madera Counties for a considerable distance, it then turns abruptly to the north just where it is joined by Fresno Slough, which drains Lake Tulare. From here its general course is northwesterly until it joins the Sacramento River, near the latter's mouth. The Chouchilla and Fresno Rivers are the principal tributaries of the San Joaquin.

The principal fishing grounds for salmon are Suisun Bay, the lower part of San Joaquin River, and the Sacramento River as high as the vicinity of Sacramento. Drift gill nets are used almost exclusively in this section. From Sacramento to Anderson there is considerable commercial fishing, more particularly with haul seines.

Owing to the early and excellent railroad facilities which the fisheries of the Sacramento River have enjoyed, they have not been handicapped so seriously as most of the other Pacific coast rivers in finding profitable outlets for the catch. Soon after the first transcontinental line was opened the shipping of fresh salmon to eastern points began, and it has been an important feature of the industry ever since.

The chief event in the history of the salmon fisheries of this river is the fact that the canning of salmon on the Pacific coast had its inception here in 1864. The circumstances leading up to this event and its consummation are interestingly told by R. D. Hume:

> The first salmon cannery of the United States was located at Washington, Yolo County, Cal. A part of the building was originally a cabin situated on the river bank outside of the levee just opposite the foot of K Street, Sacramento City. It was built in 1852 and occupied by James Booker, Percy Woodsom, and William Hume. William Hume came to California in the spring of 1852, bringing with him a salmon gill net which he had made before leaving his home at Augusta, Me. In company with James Booker and Percy Woodsom, Mr. Hume began fishing for salmon in the Sacramento River just in front of the city of Sacramento. William Hume had been salmon fishing in the Kennebec River in the State of Maine with his father, where his father and grandfather had been engaged in the same business since 1780, and their ancestors in Scotland had for pleasure pursued the sportive salmon on the Tweed and

Bay for centuries before. In 1856 William Hume went back to Maine, and on his return to California the same year was accompanied by his brothers, John and G. W. Hume, who also engaged in salmon fishing in the Sacramento River. Among the schoolmates of G. W. Hume was one Andrew S. Hapgood, who had learned the tinsmith's trade, and who a short time after G. W. Hume left for California went to Boston and entered the employ of J. B. Hamblen, a pioneer in the canning business, and was sent by him to Fox Island on the coast of Maine to engage in canning lobsters. The canning of lobster was a new and growing industry, and Mr. Hamblen, to increase his business, a short time after sent Mr. Hapgood to the Bay of Chaleur, an arm of the sea which divides the Province of Quebec from that of New Brunswick, where, in addition to the canning of lobster, they also canned a few salmon. I believe this was the first salmon canned on the American Continent, and I am informed that the business in a small way is still carried on in that section of the country. In 1863 G. W. Hume went back to Maine, and while there visited Mr. Hapgood at Fox Island, to which place he had been again sent by J. B. Hamblen to take charge of the works at that place. During the visit of G. W. Hume to his friend Hapgood a talk about salmon was had, and it was agreed that if salmon on the Pacific coast were as plentiful as represented by Mr. Hume much money could be made in a salmon-cannery business. The plan decided on was that G. W. Hume, on his return to California, should try and induce his brother William to engage in the business with them, and, if he succeeded in so doing, Mr. Hapgood should purchase the necessary machinery and come out to California in time for the spring season of 1864. William Hume being agreeable to take part in the enterprise, Mr. Hapgood set out on the journey and arrived at San Francisco on March 23, 1864, and a few days later at the location where the operations were afterwards conducted.[a]

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For a considerable time after the salmon-canning business was inaugurated the packers suspended operations in the early part of July of each year, as at that time the market would take only goods which showed a rich oil and the best food values.[b]

The business languished after the firm established its cannery on the Columbia River, but in 1874 was renewed again by others and continued with varying success until 1905, when it ceased temporarily, owing to the smaller quantity of fish available and the difficulty of competing with the mild-cure packers and the fresh-fish dealers. Several times since small packs have been made when, for some reason, mild-curing was unprofitable.

Monterey Bay.—The first harbor south of San Francisco is Monterey Bay, a large indentation cutting into Santa Cruz and Monterey Counties. Only a portion of it is well sheltered, however. For a number of years it had been known that salmon frequented the waters of this bay for the purpose of feeding on the young fishes which swarmed there. Sportsmen frequently caught them with rod and reel, but it was not until the early eighties that the industry was established on a commercial basis. It has since grown very rapidly. The catch has either been mild cured at Monterey or shipped fresh. A few were canned in 1915.

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[a] The description of the machinery used and the methods of canning have been quoted in full under "Canning" elsewhere in this report.

[b] The first salmon cannery. By R. D. Hume. Pacific Fisherman, Seattle, Wash., vol. II, no. 1, January, 1904, p. 19-21.

ALASKA.[a]

Alaska is the most favored salmon-fishing region. Many rivers, some of great length and draining enormous areas, intersect the district in every direction, while the number of small creeks is countless. Almost every one of these have runs of salmon of varying abundance. The principal streams entering Bering Sea are the Yukon, Kuskokwim, Togiak, Nushagak, Kvichak, Naknek, Ugaguk, and Ugashik; in central Alaska the Chignik, Karluk, Alitak, Susitna, and Copper Rivers are the main streams, while in southeast Alaska are found, among many others, the Anklow, Situk, Alsek, Chilkat, Chilkoot, Taku, Stikine, and Unuk Rivers. Most of the fishing in Alaska is carried on in the bays into which these rivers debouch. In southeast Alaska, which is composed largely of islands, the fishing is carried on mainly in the bays, sounds, and straits among these.

Even before the purchase of the district from Russia in 1867 our fishermen occasionally resorted to southeast Alaska and prepared salted salmon. The salmon fisheries did not become important, however, until canning was begun.

SOUTHEAST ALASKA.

One of the most favorable sections for carrying on fishing operations is southeast Alaska. Here a narrow strip of mainland, about 30 miles wide, separates British Columbia from salt water and forms the "panhandle" of Alaska. Outside this is a fringe of numerous islands, large and small, close to the coast line, conforming to its irregularities and separated from it and from each other by deep straits and channels. These islands, about 1,100 in number, extend from the coast an average distance of about 75 miles and along the general contour for about 250 miles. Some of these islands are very large, indented with deep bays and sounds, and they in turn fringed with smaller islands.

The largest streams in this region are the Unuk, Stikine, Taku, and Chilkat, all of which take their source in the interior and drain considerable areas. The other rivers are usually streams, and the greater number are simply outlets to a lake or system of lakes.

All species of salmon are to be found in this region, but the humpback is by far the most abundant.

This region has been the favorite fishing ground for the smaller operators, although a few of the largest canneries in Alaska are located here. Of recent years transportation facilities have been exceedingly good and fairly cheap, while the nearness to the States and the considerable resident population which could be drawn upon for labor have been big factors in its development.

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[a] The material for the history of the salmon fisheries of Alaska for the period from the inception of salmon canning to 1900 was obtained almost wholly from the following excellent and valuable reports by Capt. Jefferson F. Moser, U. S. N., to whom I am deeply indebted for this and other valuable data:

The salmon and salmon fisheries of Alaska. Report of the operations of the United States Fish Commission steamer *Albatross* for the year ended June 30, 1898. By Jefferson F. Moser. Bulletin U. S. Fish Commission, vol. XVIII, p. 1-178.

Alaskan salmon investigations in 1900 and 1901. By Jefferson F. Moser. Bulletin U. S. Fish Commission, vol. XXI, p. 173-398.

The Russians did considerable salting of salmon. Petroff, in his report in the Tenth Census on the "Population, industries, and resources of Alaska," writes as follows of the Redoubt near Sitka: "The once famous Redoubt or deep-lake salmon fishery on Baranof Island, which at one time during the Russian rule supplied this whole region, and whence 2,000 barrels of salmon were shipped in 1868, now lies idle."

One of the earliest operators in southeast Alaska was a Greek, or Slav, named Baronovich, who married the daughter of Skowl, one of the old-time chiefs of the Kasaans, and received from him the fishery on Karta Bay, a part of Kasaan Bay, and one of the best red salmon streams south of Wrangell Narrows. Baronovich built a saltery here, kept a store and traded with the Indians. He died some years ago, and for some time after his death his sons operated it. It finally collapsed a couple of years ago.

For a number of years a saltery was operated at Klawak, on the west coast of Prince of Wales Island. In 1878 the North Pacific Trading & Packing Co. purchased the saltery and erected the first cannery in Alaska here. A pack was made the same year, and the plant has operated every year since. In 1899 the cannery burned down, but it was immediately rebuilt on the opposite side of the bay. For some years this plant was operated almost exclusively with native labor, and at the present time the majority so employed are natives.

The same year that the above cannery was established the Cutting Packing Co. built a cannery at old Sitka, and operated it in 1878 and 1879, after which time it was closed down. In 1882 the machinery was taken by another company to Cook Inlet.

In 1882 M. J. Kinney, of Astoria, under the name of the Chilkat Packing Co., built a cannery on the eastern shore of the inlet and made a pack the same year. The cannery changed hands several times and finally was burned in 1892, and not rebuilt. The cannery packed every year from 1883 to 1891, both inclusive, except in 1888, when it was closed.

In 1883 the Northwest Trading Co., built a cannery on Pyramid Harbor, a little bay on the western side of Chilkat Inlet. It was operated by this company in 1883 and 1884, was idle in 1885, and in 1888 was sold to D. L. Beck & Sons, of San Francisco, and operated by that firm. In the spring of 1889 it was burned, but was rebuilt at once and a pack made that year. In 1893 it joined the Alaska Packers Association, which operated it, except in 1905, until the end of the season of 1908, when it was finally abandoned.

On the north shore of Boca de Quadra, about 8 miles from the entrance, a cannery was built in 1883 by M. J. Kinney, of Astoria, and operated under the name of the Cape Fox Packing Co. from 1883 to 1886. Late in the last-named year it was sold and moved to Ketchikan and operated there under the name of the Tongass Packing Co. during 1887, 1888, and until August, 1889, when it was burned and not rebuilt.

In 1886 Rhode & Johnson erected a saltery at Yes Bay. The following year the firm became Ford, Rhode & Johnson. In 1887 work was begun on a cannery which was finished in 1888. Packing was begun in 1889 under the name of the Boston Fishing & Trading Co. In 1901 it was included in the Pacific Packing & Navigation Co. consolidation, and when that concern failed was purchased in 1905 by the Northwestern Fisheries Co. In 1906 the cannery was purchased by C. A. Burckhardt & Co., who have operated it each year to date, either under that name or subsequent incorporations known as the Yes Bay Canning Co., and the Alaska Pacific Fisheries.

In 1887 the Aberdeen Packing Co. of Astoria, Oreg., built a cannery on the Stikine River, about 8 miles above the mouth. In 1889 the cannery was moved to Point Highfield, on the northern end of Wrangell Island, and operations commenced under the name of the Glacier Packing Co. In 1893 it joined the Alaska Packers Association, who have operated it continuously, except in 1905.

The Loring cannery of the Alaska Packers Association was built in 1888 by the Alaska Salmon Packing & Fur Co. of San Francisco and operated by the Cutting Packing Co. For a number of years previous to this time a saltery had been in operation here. When the Alaska Packers Association was formed in 1893 it joined that organization. The cannery has been operated every year since it was built, and in some seasons has made the largest pack of any in theTerritory.

Shortly after William Duncan and his community of Tsimpsean Indians had settled, in 1887, on Annette Island, which island had been set aside by the Federal Government as a reserve for them, plans were under way for a salmon cannery, but funds came in so slowly that it was not until 1890 that any pack was attempted. In 1891 it was in full operation, and operated from then continuously until 1913, when the plant was shut down for that and the two succeeding years. Much dissatisfaction had been expressed by the natives over the operation of this and other industrial plants on the island, and finally the Federal authorities took possession of practically everything, as guardian of the natives, and early in 1916 leased the cannery to P. E. Harris & Co., of Seattle, the understanding being that they were to employ natives when available. Unfortunately the plant burned down just before the fishing season began.

James Miller operated a saltery on Burroughs Bay, on Behm Canal, in 1886 and 1887. In 1888 Andrew and Benjamin Young, of Astoria, Oreg., built a cannery here and operated it under the name of the Cape Lees Packing Co. in 1888, 1889, and 1890. It was closed in 1891 and 1892. In 1893 it became a part of the Alaska Packers Association, and was dismantled the following year.

About 1888 a saltery was established on Thorne Bay, Prince of Wales Island. The following year it was sold to the Loring cannery. In 1892 it was sold to Robert Bell, who moved it to the upper end of the northwest arm, on the western shore. Salting was not carried on each season, as it was sometimes found to be more profitable to sell the fish fresh to the canneries. The plant was finally abandoned.

In 1889 Messrs. Sanborn and Ellmore, of Astoria, built a cannery in Pavlof Harbor, Freshwater Bay, on the eastern side of Chichagof Island, and operated it under the name of the Astoria & Alaska Packing Co. It made a pack that year and in the spring of 1890 was moved to Point Ellis, on the eastern side of Kuiu Island, packing that year and also in 1891. It was burned in May, 1892; only one building was left standing, and it and the site were purchased by John H. Mantle, of Wrangell, who operated a saltery on each arm of the bay. Mr. Mantle began operations here in 1893.

In 1889 the Baranof Packing Co. built and first operated a cannery at the Redoubt, about 12 miles below Sitka. It was also operated in 1890 and then moved to Redfish Bay, on the western coast of Baranof Island. It made its first pack here in 1891 and was then operated every year until 1898, when it was sold to the Alaska Packers Association and dismantled.

In 1889 the Thlinket Packing Co., organized at Portland, Oreg., built a cannery at Point Gerard, on the mainland opposite Point Highfield, at the head of Wrangell Island. It was operated that and the subsequent year.

In 1901 this company built another cannery at Santa Anna, on the north side of Cleveland Peninsula, and made a pack the same year.

In 1901 both plants became part of the Pacific Packing & Navigation Co. In 1902 the Gerard Point plant was closed and was not opened again. In 1903, 1904, and 1905 the Santa Anna plant was closed also. Early in 1905 these plants were purchased by the Northwestern Fisheries Co. at the assignee's sale of the old corporation's properties. The Santa Anna plant was operated in 1906 and has been operated each year since.

The Chilkat Canning Co. put up a plant at Chilkat village, on Chilkat Inlet, in 1889. It was operated from 1889 to 1893, and then sold to the Alaska Packers Association. It was held in reserve for some years but was finally dismantled.

In 1889 D. Blauw, of Tacoma, Wash., built a saltery on Grouse Island, Boca de Quadra, and dry-salted dog salmon. He operated only one season.

In 1890 a cannery was built by the Bartlett Bay Packing Co. on Bartlett Bay, Icy Straits, and operated by Williams, Brown & Co., of San Francisco. A saltery was constructed here prior to that date, and in 1889 a pack of 4,300 cases was made in a crude way. In 1891 the ice piled up in Glacier Bay to such an extent that the cannery could do almost nothing. It was not operated after this date. In 1893 it became a part of the Alaska Packers Association and was dismantled in 1894.

About 1890 a saltery was established on the north shore of the mouth of Quadra Stream, on Boca de Quadra, by Clark & Martin. It was operated intermittently until about 1898, when it was abandoned. The same parties also established a saltery at Ketchikan shortly after the one on Quadra Stream was built, and operated this until about 1898, when the plant was turned into a steamer wharf and warehouse for the new town of Ketchikan which was building up around it.

In 1896 the Pacific Steam Whaling Co. built a cannery on the northern side of Hunter Bay, near the southern end of Prince of Wales Island, and made a pack the same year. Miller & Co. had a saltery at this place and it was purchased by the company and removed to make room for the cannery. Miller & Co. also had a saltery on Nutqua Inlet, which was built in 1896, and this also was sold to the canning company. In 1901 the cannery became a part of the Pacific Packing & Navigation Co. It was closed in 1904. Upon the dissolution of the company in 1905 this plant was purchased by the Northwestern Fisheries Co., which company, after keeping it closed in 1905 and 1906, has operated it each season since.

The Quadra Packing Co. built a cannery on Mink Arm, in Boca de Quadra, in the spring of 1896 and made its first pack that year. In 1901 the plant was purchased by the Pacific Packing & Navigation Co. It was closed in 1904, 1905, and 1906. Upon the dissolution of the company in 1905 the plant was purchased by the Northwestern Fisheries Co. It was reopened in 1907 and has been operated each season since.

In 1897 a saltery was built on Taku Point, near the head of Taku Inlet. In 1898 and 1899 it was operated by the Quadra Packing Co. In 1900 the Icy Straits Packing Co. operated it.

In 1897 a small saltery was in operation by Cyrus Orr at Point Barrie, Kupreanof Island. In the same year Walter Kosmikoff operated a small saltery at Shipley Bay, on Prince of Wales Island. In 1900 he sold it to the Icy Straits Packing Co.

Fred Brockman in 1897 built and operated a small saltery on Sarkar Stream, Prince of Wales Island. Mr. Brockman operated this saltery intermittently until his death in 1915.

In 1897 Banter & West were operating a saltery at Sukkwan, on Sukkwan Island. In the same year Miller & Co. started another saltery on Kassook Inlet, on Sukkwan Island, while Thomas McCauley was operating a saltery on Whale Passage.

In 1899 the Icy Straits Packing Co., consisting of stockholders of the Quadra Packing Co., built a cannery and sawmill at a point on the southeastern shore of Wrangell Narrows, about a mile south of the northern entrance to same, and named the town site Petersburg. The cannery was ready and operated in 1900. In 1901 it became a part of the Pacific Packing & Navigation Co. It was closed in 1903, 1904, and 1905. In 1905 it was purchased at the sale of the company's properties by the Northwestern Fisheries Co. In 1906 the Pacific Coast & Norway Packing Co., which had been operating a cannery at Tonka, on Wrangell Narrows, purchased this plant and transferred its activities to the latter. In 1915 the plant was leased to the Petersburg Packing Co., composed of stockholders of the old company.

In 1900 the Western Fisheries Co., of Portland, built a cannery at the head of Dundas Bay, and made a pack the same year. In 1901 it became a part of the Pacific Packing & Navigation Co. It was closed in 1904. At the assignee's sale of the company's properties in 1905 this plant was purchased by the Northwestern Fisheries Co. and operated in 1905 and each subsequent year.

In 1900 the Fidalgo Island Packing Co. built a cannery on the southern side of Ketchikan Creek. A pack was made the same year. The plant was closed in 1903, only a little salting being done that year, but was opened in 1904. It was closed again in 1905, but opened in 1906. Since then it has been operated each season to date, except in 1909.

In 1900 the Pacific Coast & Norway Packing Co. operated a floating saltery while prospecting for a cannery location. In 1901 the company built a cannery at Tonka, about midway of Wrangell Narrows, on the western side, and made a pack in that and subsequent years until 1906. In that year the company purchased the Petersburg cannery and thenceforth operated from there. The Tonka plant was dismantled a few years later.

In 1900 the Royer-Warnock Packing Co., of San Francisco, built a small cannery on Beecher Pass, which connects Duncan Canal with Wrangell Narrows, using the old Buck saltery for the cannery proper. It operated only the one season. It was a hand-pack plant.

The Taku Fishing Co. in 1900 built a cannery on the southern side of the entrance to Port Snettisham, and made a pack in that year. In 1901 it became a part of the Pacific Packing & Navigation Co. The plant was closed in 1902 and not opened again.

In 1900 the Taku Packing Co., organized in Astoria, Oreg., built a cannery on the western shore of Taku Inlet, and made a pack the same year. In 1901 it became a part of the Pacific Packing & Navigation Co. It was closed in 1904 and not reopened again. In 1905 it became the property of the Northwestern Fisheries Co.

In 1900 the Chilkoot Packing Co., organized at Aberdeen, Wash., built a cannery at the head of Chilkoot Inlet, and operated the same year. In 1901 it became a part of the Pacific Packing & Navigation Co. It was closed in 1904 and not reopened again.

In 1900 the Great Northern Fish Co. operated a floating saltery. Its principal business was salting dog salmon for the Japanese trade, and it operated only one season. J. E. Rice, of Whatcom, Wash., in the same year packed dog salmon on Karta Bay for the same trade.

The Pacific Packing & Navigation Co. (an account of whose inception, operation, and failure appears under Puget Sound) was organized in 1901 and acquired the following canneries in Alaska: Canneries of Pacific Steam Whaling Co. at Nushagak, Bristol Bay; Chignik, Alaska Peninsula; Uyak, Kodiak Island; Kenai, Cook Inlet; Orca, Prince William Sound; Hunter Bay, southeast Alaska. Also the Hume Bros. & Hume canneries at Chignik and Uyak; the Thlinket Packing Co. with canneries at Gerard Point and Santa Anna; the Western Fisheries Co. cannery at Dundas Bay, Icy Straits; Chilkoot Packing Co. cannery at Chilkoot Inlet; the Taku Packing Co. cannery at Taku Inlet; the Taku Fishing Co. cannery at Port Snettisham; the Boston Fishing & Trading Co. cannery at Yes Bay; the Chatham Straits Packing Co. cannery on Sitkoh Bay; the Icy Straits Packing Co. cannery at Petersburg, Wrangell Narrows; and the Quadra Packing Co. cannery at Mink Arm, Boca de Quadra.

The company met with financial disaster in 1904, and at the resulting sale most of its properties were bought by the Northwestern Fisheries Co., a corporation formed for the purpose. Of the Alaska canneries the Sitkoh Bay plant was sold to George T. Myers & Co., while the Orca plant was leased to Capt. Omar J. Humphreys, from whom the Northwestern Fisheries Co. later on secured it.

The San Juan Fishing & Packing Co., of Seattle, established a cannery and cold-storage plant in 1901 at Taku Harbor, a small bay on the mainland a short distance south of Taku Inlet, and made a pack the same year. This plant was purchased in 1903 by the Pacific Cold Storage Co. and operated by it in 1903, 1904, and 1905. In 1906 it was leased and operated by the Taku-Alaska Packing Co. From 1907 to 1911 the plant was leased and operated by John L. Carlson & Co. In 1911 the plant was purchased by Mr. Carlson and the name changed to the Taku Canning & Cold Storage Co., under which name it has been operated each year since.

In 1901 the Chatham Straits Packing Co. built a cannery on Sitkoh Bay, Chichagof Island. The same year this cannery became a part of the Pacific Packing & Navigation Co. Upon the dissolution of the latter, early in 1905, this plant was purchased by George T. Myers & Co., which company has operated it to date without a break.

In 1901 F. C. Barnes, of Portland, Oreg., built a cannery at Lake Bay, on the east side of Prince of Wales Island, and made a pack that season. This cannery was operated in 1902, but was closed in 1903. It was reopened in 1904, and operated each season after that. In 1910 it was incorporated under the name of F. C. Barnes Co.

In 1901 the Union Packing Co., organized in Tacoma, Wash., built a cannery on Kell Bay, an arm of Affleck Canal, on the southern side of Kuiu Island. In 1904 this plant was moved to the Kvichak River in Bering Sea.

Buhring & Heckman operated a small saltery in Union Bay, on the north side of Cleveland Peninsula, in 1901. Packing was carried on aboard a barge.

In 1901 the Muir Glacier Packing Co. put up a saltery on Ideal Cove, Dry Pass, near Wrangell. It has operated mainly as a mild-cure station. It was closed down in 1903, but open in 1904. It was then closed in 1905, 1906, and 1907. It was opened in 1908 by K. J. Johansen and operated in 1908 and 1909.

In 1902 the Kasaan Bay Co. built a cannery on the north side of Kasaan Bay, Prince of Wales Island, and made a pack the same year. It was shut down in 1904 and 1905, but reopened in 1906 by Gorman & Co., of Seattle, who had purchased control of the company. Shortly after the closing of the packing season the plant burned down, but it was rebuilt in time to operate the following season. In 1909 the plant was closed, but was reopened in 1910. On September 12 of that year the plant was again destroyed by fire, but was rebuilt in time to operate the following season. On October 29, 1911, the plant was once more destroyed by fire, but was rebuilt in time to operate in 1912. In 1915 the plant was purchased and operated by the Anacortes Fisheries Co., a subsidiary of the Booth Fisheries Co.

In 1902 the Alaska Fish & Lumber Co. built a cannery at Shakan, on Kosciusko Island, near the head of Prince of Wales Island, and made a pack the same year. It was shut down in 1904. In 1905 the property was taken over by the Shakan Salmon Co., a new company composed largely of members of the old corporation, who operated it that season. In 1906 Gorman & Co., of Seattle, obtained control of this cannery and operated it each season under the name of the Shakan Salmon Co. until 1915, when it was sold to the Anacortes Fisheries Co., a subsidiary of the Booth Fisheries Co.

In 1902 the Columbia Canning Co. built a cannery on the southern side of Chilkoot Inlet, and made a pack that year. In 1910 C. A. Burckhardt & Co., under the name of the Chilkoot Fisheries Co., purchased and operated this plant. In 1911 the name was changed to that of the Alaska Pacific Fisheries.

The only cannery in this section lost to Alaska by action of the Federal Government was that of the Wales Island Packing Co., which was built on Wales Island, near Dixon Entrance, in 1902. As a result of the action of the Alaska Boundary Arbitration Commission in declaring Wales Island a part of Canada in 1903, this cannery automatically ceased to be an American one. After the change of government it lay idle for some time, but is now in use once more by Canadian parties.

In 1902 the Thlinket Packing Co. built a cannery on Funter Bay, on the west side of Admiralty Island, and made a pack that year and every subsequent year to date.

The same year the Pillar Bay Packing Co. built and operated a cannery near Point Ellis, on Kuiu Island, and has operated it each season to date.

In 1902 the Alaska Fisheries Union, organized in Seattle, built a cannery on the east side of Chilkat Inlet, and made a pack that year. After operating to 1905, the plant was in that year leased to and operated by the Lynn Canal Packing Co. The plant was purchased in 1906 by the Pacific American Fisheries. In 1908 it was moved to Excursion Inlet and has been operated each season to date.

The Tacoma Fishing Co. in 1902 established a saltery and halibut station at Tee Harbor, on Lynn Canal, and made a pack that year. Later it became the property of the International Fisheries Co. In 1910 the plant was purchased by the Tee Harbor Packing Co., which established a cannery and operated first in 1911. It has been operated each season since.

The Seattle-Scandinavian Fish Co. built a saltery on Snug Harbor, Tenakee Inlet, Chicagof Island, in 1902, and made a pack. It packed in 1903 also, but shut down in 1904. The plant was leased in 1905, and then shut down for good.

The Alaska Fish & Mining Co. built and operated a saltery at Revilla, on Tongass Narrows, during the single season of 1902, while the Rice Fisheries Co., in the same year, built and operated a saltery on Boca de Quadra.

The United Fish Co., of Seattle, salted at Tolstoi Bay, east side of Prince of Wales Island, 1903 and 1904.

In 1907 the Alsek Fisheries Co. did some salting on the Alsek River. Malcolm Campbell was interested in the above company and in subsequent years operated under his own name. In 1910 the St. Elias

Packing Co. established a cannery near the saltery and made a pack the same year, and in 1911 and 1912. Since then the plant has been closed and was sold in 1916 to Libby, McNeill & Libby.

The Astoria & Puget Sound Packing Co., in 1908, built and operated a cannery on Excursion Inlet. It was closed the following year, but has been operated each year since.

The year 1911 witnessed a considerable increase in the number of canneries. Among the new plants built and operated were the following: Hidden Inlet Canning Co., Hidden Inlet, Portland Canal; Hawk Fish Co. (later changed to P. E. Harris & Co.); Hawk Inlet, Admiralty Island; Lindenberger Packing Co., Roe Point, Behm Canal; Deep Sea Salmon Co., Cape Edwards, Chichagof Island; L. Gustave & Co., Skowl Arm, Prince of Wales Island (changed in 1912 to Skowl Arm Packing Co.), and M. E. Lane (a small hand-pack plant), Myers Chuck, Cleveland Peninsula.

An innovation in Alaska salmon canning this year was when the old ship *Glory of the Seas* was fitted out as a floating cannery by the Alaska Fish Co., and operated in Hawk Inlet, Admiralty Island, and at Ketchikan. Quarters for the crew were built over the cabins on the quarter deck, the latter being reserved for officials. The remainder of the upper deck was used for receiving, dressing, and cleaning the fish, which were brought on board by means of a portable elevator attached to the side of the ship. The "iron chink" and the sliming and cleaning tanks were also on this deck. The fish were carried in chutes to the second deck, where a line of sanitary machinery had been installed. The retorts were placed on the forward part of the second deck. The third deck was used for cooling and storing the pack. No lacquering or labeling was carried on aboard the vessel.

In 1912 this plant and the ship *William H. Smith*, the latter by the Weiding & Independent Fisheries Co., of Seattle, were operated. The *William H. Smith* also did some freezing of salmon.

In 1913 the *Glory of the Seas* was sold to the Glacier Fisheries Co., which operated it as a cold-storage plant. The floating cannery and cold-storage ship *William H. Smith* was not operated in Alaska during this season.

In 1912 still more canneries were built, among these being the following: Admiralty Trading Co., Gambier Bay, Admiralty Island; Alaska Sanitary Packing Co., Wrangell; Canoe Pass Packing Co., Canoe Pass; Herbert Hume Packing Co., Nakat Inlet, Portland Canal; Hoonah Packing Co., Hoonah, Icy Straits; Irving Packing Co., Karheen; Kake Packing Co., Kake; Kuiu Island Packing Co., Point Beauclaire, Kuiu Island; Lindenberger Packing Co., Craig, Fish Egg Island; Oceanic Packing Co., Waterfall; Point Warde Packing Co., Point Warde, Bradfield Canal; Pure Food Fish Co., Ketchikan;

Revilla Fish Products Co., Ketchikan; Sanborn-Cram Co., Burnett Inlet; Starr-Collinson Packing Co., Moira Sound; Sunny Point Packing Co., Cholmondeley Sound; Swift, Arthur & Co., Heceta Island; Walsh-Moore Canning Co., Ward Cove, and Wiese Packing Co., Rose Inlet.

In 1913 the plant of Swift, Arthur & Co. was used as a mild-cure station alone, while the name was changed to the Swift-Arthur-Crosby Co. The Alaska Fish Co. absorbed the Oceanic Packing Co. and transferred its activities to the former company's cannery at Waterfall. The following other plants were shut down: Canoe Pass Packing Co., Herbert Hume Packing Co., Point Warde Packing Co., and the Revilla Fish Products Co.

In 1914 one new cannery was built. This was erected on George Inlet, Revillagigedo Island, by the George Inlet Packing Co. The canneries of the Point Warde Packing Co., located at Point Warde, and the G. W. Hume Packing Co. (formerly the Herbert Hume Packing Co.), at Nakat Inlet, which were not operated in 1913, were reopened in 1914. The cannery of the Swift-Arthur-Crosby Co. was also reopened. The Walsh-Moore Canning Co. changed its name to the Ward Cove Packing Co., while the Sanborn-Cutting Co. took over the cannery operated by the Kake Packing Co. The canneries of the Admiralty Trading Co. and the Skowl Arm Packing Co. were closed in 1914. The plant of the Kuiu Island Packing Co. burned down in the fall.

In 1915 the Admiralty Trading Co. did not operate. Late in the summer it was sold to the Hoonah Packing Co., which company expects to operate it in 1916. The new canneries this year were the Doyhof Fish Products Co., at Doyhof, on Wrangell Narrows, and Edward Verney & Son (a hand plant), at Metlakahtla. The name of the Irving Packing Co. was changed to the Karheen Packing Co. The Straits Packing Co. purchased the Skowl Arm cannery of the Skowl Arm Packing Co. and operated it.

At one time salteries were of considerable importance in this section, but the establishment of canneries, with the consequent heavy demand for fresh salmon, induced most of the salteries to sell their high-grade fish to the canneries and pack only the cheaper grades. Many of them quit the business as a result of the competition, while others were forced out by the low prices prevailing at times for salted salmon. As many of the salters moved from place to place, and frequently changed their operating name, it has been difficult to keep track of them, and in this review only those are listed who attained to some prominence either through longevity or largeness of pack.

James Millar, one of the earliest whites to take up his residence here after the purchase of Alaska, and his sons were very active in starting and operating salteries, and it was an unusual thing during the period previous to 1910 when one of the family was not operating such a plant.

Jacob Louth established a saltery on the south arm of Moira Sound about 1900 and operated it for some years.

John C. Frey established a saltery on Etoline Island in the nineties and ran it until his death in 1904, when John H. Mantle purchased and operated it until about 1910.

Anderson & King built a saltery on Cholmondeley Sound, Prince of Wales Island, in the nineties. In 1904 it was operated under the name of A. E. King. After Mr. King's death his widow operated it from 1906 to 1909. In 1910 the saltery was purchased by C. A. Burckhardt & Co., who built a cannery on the site and began operations in 1911. In 1912 the name was changed to the Alaska Pacific Fisheries.

The Alaska Fish & Development Co. built a saltery on Pleasant Bay, Admiralty Island, in 1903, and operated it from 1903 to 1905. In 1907 it was operated by the Alaska-American Fish Co., but has been closed since.

Yakutat Bay is the only harbor available for vessels from Cape Spencer to Prince William Sound. In 1902 C. A. Fredericks & Co., of Seattle, Mulvey & Wilson, of Yakutat, Jewell Fish Co., and Ankow Fish Co. all established salteries here. While their primary purpose was the salting of herring, considerable salmon was also salted. These plants operated only the one season.

In 1904 the Yakutat & Southern Railway Co. built a cannery here. This plant is noted for being the only one that hauls its fish by railway from the fishing streams to the cannery. The railroad is a little over 9 miles in length, and for some years an engine which had seen service on the elevated railroads of New York City and was discarded when the latter were electrified was used. A more modern engine is now in use. The fish are carried in open freight cars. Later this company was purchased by Gorman & Co., and now is the property of Libby, McNeill & Libby, although operated under the original name.

PRINCE WILLIAM SOUND AND COPPER RIVER.

The great indentation known as Prince William Sound, and the Copper River delta, a short distance south of the sound, have not been exploited as much as many other portions of Alaska, due largely to the limited means of transportation and the consequent heavy expense of operation.

The principal source of salmon supply is the Copper River, which has its source far back in the interior and discharges through its numerous mouths an immense quantity of water.

Owing to the constantly shifting shoals in the delta, special knowledge is needed in navigating them, while special flat-bottomed vessels are required as run boats. The gill net is the only important apparatus in use.

In 1889 a company known as the Central Alaska Co. built a cannery on Wingham, or Little Kayak Island, about 15 miles west from Cape Suckling. It made a pack that year, and the following spring was moved to Thin Point, on the southern side of the Alaska Peninsula.

The Peninsula Trading & Fishing Co. built a cannery on the same island in 1889. In 1891 it was moved to one of the sloughs of the Copper River delta, known as Coquenhena, and operated in 1891. It was closed in 1892 and 1893. The Pacific Steam Whaling Co. operated it until 1897, when it was abandoned.

In 1916 the Hoonah Packing Co. built and operated a cannery near the mouth of Bering River.

Louis Sloss & Co., of San Francisco, built a cannery under the title of Pacific Packing Co. in 1889 at the extreme eastern end of the sound, close by the present site of Cordova, and called it Odiak. The cannery was closed in 1892. In 1893 it joined the Alaska Packers Association and was operated each season until 1905. In 1906 the buildings and site were sold to the Copper River & Northwestern Railroad Co., which was preparing to build a railroad from Odiak to the headwaters of the Copper River.

In 1889 the Pacific Steam Whaling Co. built a cannery close by the Odiak plant, but in the spring of 1895 it was moved to the spot now known as Orca, about 3 miles north of Cordova. Except in 1892, it has been operated ever since. In 1901 it was taken into the Pacific Packing & Navigation Co. combination. When the latter's assets were sold in 1904, this cannery was not included in the sale, as at the time the plant was under lease to Capt. Omar J. Humphrey. In 1905 it was sold to the Northwestern Fisheries Co., which had purchased most of the Alaska plants of the defunct company, and they have operated it since.

In 1915 the Copper River Packing Co. built a cannery on the Copper River at Mile 55, and made a pack the same year. The cannery uses no run boats, but has an arrangement with the Copper River & Northwestern Railroad Co. to haul the fish from the fishing stations to the cannery, and bring the finished product to Cordova for shipment by steamer.

The Canoe Pass Packing Co., which had built a cannery at Canoe Pass, southeast Alaska, in 1912, and had not operated it subsequently, in 1915 moved the machinery to Cordova and installed it in a rented building and made a pack.

This year (1916) the Carlisle Packing Co. built a cannery at Cordova, while the Clark-Graham Co. built one at Eyak, a few miles away.

COOK INLET.

While this great inlet has an abundant supply of salmon, it is one of the most difficult sections in all Alaska in which to fish successfully. The tides and currents in the inlet are strong and treacherous, increasing in height and force as its head is approached, where the tide comes in with a bore which is extremely dangerous to small craft. Shoals make out a long distance from shore and are continually changing.

The first cannery to be built on the inlet was in 1882, when the Alaska Packing Co., of San Francisco, built one at Kasilof, on the right bank of the Kasilof River at the mouth, utilizing the available machinery from the cannery built by the Cutting Packing Co. at old Sitka in 1878. In 1885 this cannery was sold to the Arctic Fishing Co. In 1890 the loss of its cannery ship forced it to close that season. In 1893 it joined the Alaska Packers Association. At the height of the season of 1905 the plant was burned. It was rebuilt the next spring and has been operated each year since.

The cannery of the Northern Packing Co. was built in 1888 on the eastern side of Cook Inlet, at Kenai, at the mouth of the Kaknu River. It was operated up to and including 1891. In 1893 it joined the Alaska Packers Association, but has not been operated since 1891.

In 1897 the Pacific Steam Whaling Co. built a cannery at Kenai, but did not install the machinery and operate it until the next year. In 1901 this cannery was taken over by the Pacific Packing & Navigation Co. In 1903 the plant burned down. Upon the sale of its assets in 1905 the site passed to the Northwestern Fisheries Co. In 1910 the company put up a new plant here and has operated it continuously since. During the period when the site was unused a mild-curing establishment was operated here by the San Juan Fishing & Packing Co. in 1907 and 1908. This plant was burned down just before the fishing season of 1916 began.

In 1890 George W. Hume, of San Francisco, built a cannery at Kasilof, on the right bank of the river, about half a mile above its mouth. It was operated in 1890, 1891, and 1892. In 1893 it joined the Alaska Packers Association and was consolidated with the plant of the Arctic Fishing Co.

C. D. Ladd operated a saltery on the left bank and at the mouth of the Chulitna River, about 6 miles above Tyonek. This saltery was purchased by the Alaska Salmon Association in 1899. The following spring it erected a cannery here and made a small pack. It was operated also in 1901 and 1902, and then abandoned.

In 1907 J. A. Herbert & Co. established a saltery at English Bay and operated it until 1910.

In 1911 the Seldovia Salmon Co. built a cannery at Seldovia and operated it continuously to date. Late in 1915 the company went into the hands of a receiver. In 1916 it was reopened by the Columbia Salmon Co.

In 1912 the Fidalgo Island Packing Co., which already operated a cannery at Ketchikan, in southeast Alaska, built a cannery at Port Graham, at the lower end of the Kenai Peninsula. A pack was made that year and each year since.

The same year Libby, McNeill & Libby built a cannery at Kenai and operated that year and each subsequent year.

In 1915 the Deep Sea Salmon Co., which operates a cannery in southeast Alaska, built a plant near Knik, on the west side of Cook Inlet, and made a small pack.

AFOGNAK ISLAND.

Afognak Island lies to the northwest of Kodiak, and it is separated from it by a narrow strait.

In 1889 the Royal Packing Co. built a cannery at the head of Afognak Bay and operated it in 1889 and 1890. It became a member of the Alaska Packers Association in 1893. It has not been operated since 1892.

The Russian-American Packing Co. in 1889 built a cannery immediately above that of the Royal. It was operated in 1889 and 1890. In 1893 it became a member of the Alaska Packers Association. It has not been operated since 1890.

In accordance with an act of Congress approved March 3, 1891, the President, by proclamation of December 24, 1892, set aside the whole island and within 1 mile from the shores thereof as a fish-cultural reserve for the use of the United States Commission of Fish and Fisheries. As a result of this action both canneries were forced to move from the island entirely.

KODIAK ISLAND.

This island has been the scene of some of the best fishing in Alaska. The Russians early settled here, one of the most fertile spots in the usually sterile soil of Alaska, and undoubtedly they must have prosecuted the fisheries from an early date, although but little data are extant showing their operations in this line.

Karluk River and Lagoon.—One of the greatest salmon streams in the world is the Karluk River, and although extensive fishing operations have been carried on for many years, it still produces, annually, a large pack of canned salmon, and has the distinction of having produced more salmon than any other river in Alaska. An exceptionally heavy run occurred in 1916.

It will doubtless surprise most readers when it is stated that the river which has yielded so many countless thousands of salmon is only 16½ miles in length. The river has its source in two lakes; the larger of these is about 8 miles long and the smaller 3 miles long. The mouth of the river is about 2 miles above the canneries, and spreads out here into a lagoon. This lagoon has at the head a width of about 300 yards, and gradually widens until it is nearly half a mile across as it approaches the spit. The lagoon has a general east and west direction, is about 2 miles in length, and, except for the shingle spit which is thrown across its mouth by the action of the sea, its shores are bluff, rising from about 50 to 100 feet. The spit is three-fourths of a mile long with an average width of about 200 feet. The outlet of the lagoon is only 90 feet wide at its mouth. The western side of the mouth of the lagoon is Karluk Head, a precipitous mountain mass about 1,600 feet high.

The outer side of the spit is where the fishing is carried on. Haul seines are used exclusively. As bowlders used to be common here it was necessary to remove a number of them in the early days when a seine shore was to be prepared. The red salmon run here is an exceptionally long one, the season extending from about the middle of June to about the middle of September. The other species of salmon also run here; sometimes humpbacks appear in large numbers. As the beach is open to Shelikof Strait, in which storms are frequent, seining is often interrupted.

As early as 1867 the salting of salmon was carried on at Karluk. In 1870 the Alaska Fur Trading Co. and the Alaska Commercial Co. began to salt salmon and continued this on a gradually expanding scale.

In 1882 Smith & Hirsch, who had been engaged in salting on Karluk Spit, built the first cannery on Kodiak Island. After operating it until 1884 it was organized under the title of the Karluk Packing Co., and packed under that name every year until 1911, when canning operations were transferred to the new cannery in Larsen Bay. In 1893 it joined the Alaska Packers Association.

The Kodiak Packing Co. in 1888 built a cannery on the eastern side of the spit and operated it in 1888, 1889, 1890, 1891, and 1893. It joined the Alaska Packers Association in 1893, but has not been operated since that season.

The Hume Packing Co. built a cannery on the spit about 400 yards westward of Kodiak cannery in 1889. In 1892 it was consolidated with the Aleutian Islands Fishing & Mining Co., which had built a cannery about 100 yards westward of the Hume cannery in 1888. In 1893 the consolidation became a member of the Alaska Packers Association. This plant was not operated in 1900.

In 1888 the Alaska Improvement Co. built a cannery on the left bank of the outlet, opposite the point of the spit and facing the Shelikof Strait. It was ready to pack in 1888, but was not operated on account of the loss of its cannery ship, the *Julia Ford*. In the spring of 1897 it was sold to the Alaska Packers Association and has since been operated by that company.

In 1893 the Hume Canning & Trading Co. built a cannery on the beach under Karluk Head, about three-fourths of a mile northward of the Alaska Improvement Co., in what is known locally as Tanglefoot Bay. It was operated in 1893 and 1894, and in 1895 it was sold to the Alaska Packers Association and operated by that company. It has been closed since.

The great increase in the number of canneries in Alaska in 1888 and 1889 caused such an enlargement of the pack that the markets became glutted, and it was soon apparent that steps would have to be taken to reduce the output if the operators were to avoid bankruptcy.

Capt. Moser in "Salmon and salmon fisheries of Alaska"[a] thus describes the attempts of the canners to find a working solution of this important problem and the final result of their endeavors:

> In 1890 the three canneries at Chignik combined under an operating agreement known as the Chignik Bay Combination, under which the plant of the Chignik Bay Co. was operated, the three canneries sharing the expense and dividing the output equally. This arrangement remained in force during the seasons of 1890 and 1891. Its evident success in 1890 probably led to the local combinations on Kodiak Island in 1891, and then to the association which now exists.
>
> The large packs during this period and the glutted market caused the cannery interests to devise some scheme to meet the conditions. The combination at Chignik in 1890 permitted the pack to be made there at a lower rate and, as previously stated, it was continued in 1891. The same year (1891) the canneries at Karluk, Uyak, and Afognak entered a combination, under the name of the Karluk River Fisheries, under which it was agreed that each cannery should have a quota of fish from the several localities, based upon the average packs of each cannery in 1889 and 1890. The estimated pack for the canneries interested was placed at 250,000 cases, and upon this estimate the apportionment of the work at each cannery was made. Under this agreement four of the eight canneries were closed, their quota being packed in the other four canneries as follows, viz, that of the Royal at the Karluk, of the Arctic at the Kodiak, of the Aleutian Islands at the Hume, and of the Russian-American at the Alaska Improvement.
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> In the summer of 1891 the Kodiak Packing Co. and the Arctic Packing Co., both at Alitak Bay, also had a mutual agreement under which only one cannery, the Arctic, was operated, the quota of fish of the Kodiak being packed in the Arctic cannery. By these combinations the full pack of the Karluk district was made in half the number of canneries and the expense of packing very considerably reduced.
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> In September, 1891, the Alaska Packers Association was formed to dispose of the unsold salmon of that season's pack (some 363,000 cases) and five trustees were appointed to manage the business. This association was not incorporated and expired after the salmon were sold.

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[a] The salmon and salmon fisheries of Alaska. Report of the operations of the U. S. Fish Commission steamer *Albatross* for the year ended June 30, 1898. Bulletin U. S. Fish Commission, vol. XVIII, 1898, p. 18-21.

The successful operation of these arrangements led, in 1892, to an arrangement in which nearly all (31) of the canneries joined, entering under the name of the Alaska Packing (not Packers) Association, for the purpose of leasing and operating and therefore controlling the canneries and reducing the Alaska pack for that year, it being found too great for the market's demands. All the canneries in operating condition in 1892 were members of this association except the following: Metlakahtla Industrial Co., at Metlakahtla; Boston Fishing and Trading Co., at Yes Bay; Baranoff Packing Co., at Redfish Bay; Chilkat Canning Co., at Pyramid Harbor; Alaska Improvement Co., at Karluk; and the Bering Sea Packing Co., at Ugashik.

The association was regularly incorporated on January 13, 1892, and shares were distributed on the basis of 1 for each 2,000 cases packed in 1891, and the profits were divided equally on all shares regardless of the amount of profits derived at the different points. Of the 31 canneries, 9 were operated by the association, while the others were closed, the Alaska pack being reduced one-half.

The year 1893 found the Alaska Packers Association organized and incorporated February 9. This association was formed from the canneries that had joined the Alaska Packing Association of 1892, except the Pacific Steam Whaling Co., at Prince William Sound, and the Peninsula Trading and Fishing Co., the latter's cannery having been moved from Little Kayak Island to the Copper River delta in 1891.

The agreement of 1893 was similar to that of 1892, except that the amount of profit was taken into consideration in addition to the probable average quantity which could be packed at the different points. This was subject to adjustment for each district and no arbitrary rule was followed. Each cannery entering the association was obliged to purchase an additional amount of stock, equaling two-thirds of the number of shares received by it for its plant; that is, a company which received 1,500 shares for its plant was required to purchase 1,000 shares additional. The money received from this sale of extra stock was used as working capital. No shares were sold to the general public, the owners of canneries subscribing for the full amount.

This association was then and is now (1916) the largest operator in Alaska, and, with its three canneries on Puget Sound, is also a factor in that region.

At a number of its canneries the association has always maintained physicians, whose services and supplies have been free to its own employees and to all natives applying for medical advice and medicines. This service has been of incalculable benefit to the latter, a large proportion of whom suffer from disease in some form or other.

Alitak Bay.—Alitak Bay, or the "South End," as it is termed locally, is a deep indentation, with several arms, on the southwestern end of Kodiak Island, about 65 miles from Karluk. The seine is the principal apparatus used here.

In 1889 the Arctic Packing Co. built a cannery in the southwest bight of Olga Bay, which is a branch of Alitak Bay and is connected with it by a long, narrow passage. In 1893 it entered the Alaska Packers Association.

In 1889 the Kodiak Packing Co. built a cannery at Snug Harbor, a cove in the passage connecting Olga Bay with Alitak Bay, and operated it in 1889 and 1890. Its quota of fish was packed by the Arctic Packing Co. in 1891. In 1893 it joined the Alaska Packers Association and the same year was dismantled.

Uyak Bay.—Uyak Bay is on the northwestern side about the middle of Kodiak Island and is a considerable body of water with ramifying arms. On the western shore, near the entrance and about 18 miles from Karluk, is Uyak Anchorage. The harbor is formed by the main shore of the island and Bear and Harvester Islands, and is frequently used as an anchorage by cannery ships and the steamers from Karluk during bad weather. As there are no red salmon streams in Uyak, fishing is carried on elsewhere. Most of it is at Karluk Spit.

In the spring of 1897 the Pacific Steam Whaling Co. and Hume Bros. & Hume built canneries on the main shores at Uyak Anchorage. In 1901 both plants became a part of the Pacific Packing & Navigation Co. and were operated by it. In 1905 the Uyak plants were purchased by the Northwestern Fisheries Co., and the same year one of the plants was destroyed by fire and was not rebuilt. The remaining plant has been operated each year since.

Five miles southeast from Uyak Anchorage is a narrow arm called Larsen Bay. It is 4 miles long. Immediately within the entrance on the northern shore is the site of the cannery of the Arctic Packing Co., which was built in 1888, and operated in that year and 1889 and 1890, since which date it has been closed. In 1893 it became a part of the Alaska Packers Association and in 1896 it was dismantled.

As the association had lost several ships while loading at Karluk, it finally decided to move its plants from that place, and in 1911 a cannery was built at the old site on Larsen Bay and from that time all cannery operations formerly carried on at Karluk have been performed at this plant.

Uganuk Bay.—This bay is next to the eastward of Uyak. For several years a saltery was operated here by Oliver Smith, who sold it to the Alaska Packers Association in 1896. The same year the latter built a cannery on the bay. It made a pack in 1896 and a partial pack in 1897. This cannery was abandoned in 1900.

Kodiak.—Salting operations have been carried on at this old Russian settlement for a number of years.

In order to furnish work for the natives, the Alaska Commercial Co. and Blodgett & Blinn salted the catches made by them in 1906 and subsequent years until 1912, when the Kodiak Fisheries built a cannery and has operated it each year since.

The Woman's American Baptist Home Missionary Society had carried on a home and school for native children on Wood Island, close to Kodiak, for some years. In 1902 the society established a salmon saltery here in order to furnish employment for the natives. No data are recorded in the official reports of further activities on the part of this plant.

CHIGNIK BAY.

Chignik Bay is on the southern side of the Alaska Peninsula and is the first important indentation after leaving Cook Inlet on the way to the westward. The bay is about 150 miles southwest of Karluk. On the westward side of the bay is a small deep bay known as Anchorage Bay. Several of the canneries are located here and the transporting vessels of all the canneries make their anchorage at this point. In the extreme southwest corner of Chignik Bay is the entrance to Chignik Lagoon. At the head of this lagoon, from which all the canneries draw their supplies of red salmon, is the mouth of the stream up which go the schools.

Chignik River is about 6 miles long, with an average width of 100 yards. The depth in the river is such that a boat can ascend only at high water. The river has its rise in two lakes, each about 10 miles long.

Red salmon predominate in the runs, although all five species are to be found. A run of very small red salmon, weighing about 2 pounds, and known as Arctic salmon, appears here every year.

Practically all of the fishing here is with traps, although gill nets and seines have also been used at times.

This bay, next to Karluk Spit, has been the scene of more bitter fights for supremacy in canning than any other place in Alaska.

In 1888 the Fishermen's Packing Co., of Astoria, Oreg., sent a party to Chignik Bay to prospect for fish, and they returned in the fall with 2,160 barrels of salt salmon.

The next year, this company, operating under the name of the Chignik Bay Co., built a cannery on the eastern shore of the Lagoon, 2½ miles from the entrance.

The same year the Shumagin Packing Co., composed of capitalists from Portland, Oreg., and the Chignik Bay Packing Co., of San Francisco, built and operated canneries close to that of the Chignik Bay Co. All three of these companies soon arrived at a working agreement and finally combined into one organization. All were operated in 1889, 1890, and 1891. In 1892 they all joined the pool of the Alaska Packing Association, and the cannery of the Chignik Bay Co. alone operated. In 1893 they all became members of the Alaska Packers Association.

Since 1891 only the cannery of the Chignik Bay Co. has been operated. The Shumagin building has been moved alongside the former and the machinery consolidated, so as to form practically one large cannery.

In the spring of 1896 Hume Bros. & Hume built a cannery on the eastern side of Anchorage Bay and made a pack that year and in 1897.

The same spring the Pacific Steam Whaling Co., built a cannery one-fourth of a mile south of the Hume cannery, and made a pack that year and in 1897. In 1901 this plant, also that of Hume Bros. & Hume, became part of the Pacific Packing & Navigation Co. The failure of this company in 1904 threw its properties onto the market and most of them, including the two Chignik canneries, were purchased by the Northwestern Fisheries Co., which in 1905 shut down the Hume Bros. & Hume plant for good and has operated the other plant ever since.

In 1910 the Columbia River Packers Association built and operated a cannery on Anchorage Bay, and has operated it every year since.

ALASKA PENINSULA.

Of recent years canneries have been located on the Bering Sea side of the Alaska Peninsula, outside of Bristol Bay proper, but it is probable that their numbers will not be large in the future as the fisheries tributary to them are not very extensive, and are also very much scattered, making transportation expensive.

Port Heiden.—This important indentation on the Bering Sea side of the Alaska Peninsula, about midway between the Ugashik River and Port Moller, has never figured to any considerable extent in fishing operations. In 1912 and 1913 Gorman & Co. had the schooner *Harriet G.* located here throughout the season, engaged in salting salmon.

Port Moller.—This great indentation in the Alaska Peninsula, between Port Heiden and Nelson Lagoon, was neglected for many years for the more profitable Bristol Bay region.

About 1902 the Bering Sea Packing & Trading Co. (there seems to be some confusion between this name and that of the Peninsular Packing Co., the latter being the name the company was known by after the first year or two in the official records), established a saltery on Bear River, a tributary of Port Moller, and operated it until 1906, after which operations were suspended and but little is now left of the plant.

In 1912 the Pacific American Fisheries erected a cannery on Port Moller, but it was not operated until 1913. This concern has been successful mainly because of its introduction of purse seines in fishing operations.

Nelson Lagoon.—Nelson Lagoon is on the Bering Sea side of the Alaska Peninsula, is about 6 miles in length and about 2 miles in width. At its western end debouches the Nelson River, which is about a mile wide at its mouth. About 18 miles from the mouth the river divides, both branches having their rise in lakes. There is an easy portage from the lakes to Pavlof Bay, on the Pacific side of the peninsula, and this route is used frequently by both white men and Indians.

The run is mainly of red salmon, and gill nets and traps are utilized. During the last few years purse seines have been used in this region with considerable success.

In 1902 Charles Johnson, who had operated on the Ugashik River, established a saltery here and operated it under the name of the Lagoon Salmon Co., and made a pack that and the succeeding year. In 1904 and 1905 it was shut down. It was reopened in 1906 and continued to operate until it was sold in 1914, and in 1915 the new owners, the Nelson Lagoon Packing Co., built and operated a cannery here.

Unalaska Island.—This year (1916) the Pacific American Fisheries, having obtained a permit from the Department of Commerce, built a cannery at Unalaska, on Unalaska Island. This cannery is located inside of the Aleutian Islands reserve, and permit was given for its building and operation so that it might be possible for the Indians of Unalaska and Dutch Harbor to obtain work at home and save them the long trip to the Bristol Bay plants.

Ozernoy.—In 1889 a cannery, under the title of the Western Alaska Packing Co., was built at Ozernoy, on the western side of Stepovak Bay, south side of the Alaska Peninsula. It packed that year and in 1890, but the fish were so scarce that the cannery was dismantled in 1891 and the site abandoned.

Nothing was done with it for some years, but about 1905 Bostrop Omundsen located there and established a saltery. In the winter of 1912–13 August Lindquist purchased a half interest in the plant and it was operated under their joint names until the death of the senior partner in the fall of 1915; since then it has been operated by the former alone.

Thin Point.—Thin Point is on the southern side of the Alaska Peninsula, near its extreme western end. A saltery was operated here for several years, until the Thin Point Packing Co. was organized by Louis Sloss & Co., of San Francisco, and the cannery was built in 1889. It was operated in 1889, 1890, and 1891, and was closed after that date. In 1890 the cannery ship *Oneida*, en route for this place, struck on the Sannaks in April and nearly all of the 77 Chinese on board were lost. In 1893 the plant became a member of the Alaska Packers Association. In 1894 the cannery was moved to the Naknek River, in Bering Sea, and became a part of the cannery of the Arctic Packing Co.

The Alaska Packers Association operated a saltery at Thin Point in 1894, 1895, and 1896, and then abandoned the place.

The cannery of the Central Alaska Co. was moved in 1890 from Little Kayak Island, near Katalla, to Thin Point. It operated during 1890 and 1891, was closed in 1892, and in 1893 joined the Alaska Packers Association, but was no longer operated. In 1895 the available machinery was moved to Koggiung on the Kvichak River, in Bering Sea.

In 1908 Osmund & Andersen established a saltery at Thin Point and operated it in 1908, 1909, and 1910.

In 1911 the Pacific American Fisheries built a cannery at King Cove, on the south side of the Alaska Peninsula, a few miles east of Thin Point, and in the fall purchased the saltery. The cannery was operated in 1911 and each year since.

SHUMAGIN AND SANNAK ISLANDS.

Small salteries have been operated at different places on the Shumagin and Sannak groups. The plants have usually been rude and primitive affairs and were operated whenever the price of salted salmon was high enough to justify same. As the ownership, and the location in many instances changed frequently, no attempt has been made even to list them.

BERING SEA.

The great redfish producing section of the world is in the Bristol Bay section of Bering Sea. This bay lies in the eastern section of Bering Sea, inside of a line drawn from Port Moller to Cape Newenham, and a number of important rivers debouch into it, in all of which the annual runs of salmon, especially reds, are important.

Bristol Bay is considerably off the line of steamship travel, and as a result the companies operating here are compelled to have ships in which to bring up their employees and supplies in the spring and to take back the men and prepared products in the late summer or early fall when the season has ended.

Cannery ships belonging to the Nushagak plants are taken into the bay and anchored as near the canneries as possible. Owing to shoals this can not be done on Kvichak Bay and the Naknek and Ugaguk Rivers. In the early days of the fisheries the ships running to the latter canneries were brought as close to the plants as possible, unloaded by means of scows, and then taken to the Nushagak for shelter. When their numbers were too great to permit of this they were moored in the open about 5 miles off the point separating Kvichak Bay and Naknek River, where the anchorage is good and the vessels have very little trouble in riding out storms. Usually the captain and a boy are left aboard the ship.

NUSHAGAK RIVER AND BAY.

The Nushagak River, sometimes called the Tahlekuk, with its tributaries, and the Wood River, which enters the head of Nushagak Bay close by the mouth of the Nushagak, form a favorite resort of the red salmon, while all other species also ascend them.

But little is known of the upper courses of the Nushagak River, except that they drain the region between Lakes Clark and Iliamna on the east and the Kuskokwim on the west.

The river is said to be 200 miles long to the first lake, a large one. Beyond this lake there are three other smaller lakes, all connected by short stretches of river. The largest tributary of the river is the Malchatna, which enters it about 100 miles from the mouth. There are also several small tributaries, two of these being Tikchik River and Portage Creek. There are three or four Indian villages on the Nushagak, Kaknak being the largest. A launch drawing 3 to 3½ feet of water can navigate about 120 miles from the mouth. It is necessary to use a "bidarka" to go into the upper reaches. There are four rapids, around which a portage must be made in each case.

The river on its lower course is large, and flows a great quantity of water into the head of Nushagak Bay.

Wood River is about 24 miles long from its mouth to the first lake. Shoals and bars are frequent in the river, the depth on these at low water being 2½ feet and at high water 4 feet.

Aleknagik Lake, the first of the chain of three, is about 24 miles long, and has an average width of about 2 miles.

Wood River is noted especially for the interesting counting experiment the Bureau of Fisheries is carrying on here. This very important work was first taken up in 1908, as an indirect result of the order closing Wood and Nushagak Rivers to the commercial fishermen, as noted below, and has been continued, with the exception of 1914, to the present time. This work is made possible by the generosity of the Alaska Packers Association of San Francisco and the Alaska-Portland Packers Association of Portland, Oreg., who furnish the material and erect the barricade, also the labor needed throughout the season, while the Bureau of Fisheries furnishes the personnel required to carry on the direct work of counting the fish and making other observations.

A rack or trap is constructed across the foot of Lake Aleknagik, at a constriction in the lake contour something more than 200 yards wide, for the purpose of intercepting all salmon entering the lake and passing them through gates or tunnels at such a rate and in such a manner that an accurate estimate of their numbers can be obtained. The pot of the trap is located near the left bank, and this has three gates by which the salmon can be passed from the pot into the lake. Each gate is 2 feet in width, and its bottom rests on a wooden platform covered with white oilcloth, so that the fish can readily be seen as they pass over it when the gate is raised. When fish are passing through a gate a small wooden frame with a glass center is arranged so it will float on the water, and in order to hold it in position it is fastened to the framework of the gate. This is for the purpose of making the water smooth so the fish can readily be seen even though the surface be disturbed by ripples, etc.

When the fish are coming rather slowly every one is counted by means of a tally register as it passes out through the gates. When the large run comes the following method is employed: An actual tally of every salmon passing through is made for one minute, and this is repeated 15 minutes later, the number passing through for one minute being regarded as the average for 15 minutes. A sheet with the whole day divided into quarter hours is kept ready at the gate and the number for one minute as taken from the tally register is immediately entered thereon by the attendant who made the tally. From these figures the total for the day is obtained. During only a small part of the season has it been found necessary to resort to this method of estimating the run.

The following table shows for each year since 1908 the commercial catch of salmon made in Nushagak Bay, the number of fish passing from Wood River into Lake Aleknagik, the total of both and the percentage of salmon that escaped the fishermen:

Years.	Nushagak Bay catch.	Wood River tally.	Total.	Per cent of escape.
1908	6,140,031	2,600,655	8,740,686	30
1909	4,687,635	893,244	5,580,879	16
1910	4,384,755	670,104	5,054,859	13.2
1911	2,813,637	354,299	3,167,936	11.1
1912	3,866,950	325,264	4,192,214	7.7
1913	5,236,008	753,109	5,989,117	12.5
1914	6,074,432	(a)		
1915	5,616,457	259,341	5,875,798	.4
1916		551,959		

[a] Work not carried on this year.

Snake River, a tributary of Nushagak Bay, is about 30 miles in length, very crooked, and has its rise in a single lake close by Aleknagik Lake. There is an Indian village on the river just below the lake. Red salmon are abundant in this stream.

Igushik River is about 50 miles in length and enters Nushagak Bay about 4 miles above Nichols Hills. So far as known it has its source in two lakes—Amanka and Ualik. A short distance below the first lake there are rapids and a small falls. The quite large Indian village of Yacherk is located here, and the natives do most of their fishing in the rapids. Peter M. Nelson established a saltery about 10 or 12 miles above its mouth in 1902, and operated it until he sold it to the Alaska Fishermen's Packing Co., who have operated it since. There is a small Indian village close by the saltery.

Nushagak Bay, in which practically all the fishing is carried on, is about 35 miles long and from 5 to 15 miles wide. Sand bars and mud flats, which are visible at low water, occupy the greater part of its area.

The drift gill net is the favorite apparatus in this bay, although a few traps are also used. The fish begin to run very early here. Kings usually appear about June 5, reds about June 5 to 8, cohos appear either late in June or early in July, chum salmon about the middle of June, and humpbacks about the same time.

Considerable fishing was carried on in both the Nushagak and Wood Rivers until in 1908, when, as a result of a hearing held by the Secretary of Commerce and Labor on December 16 and 17, 1907, it was decreed that beginning January 1, 1908, "it is hereby ordered that until further notice Wood River, a tributary of Nushagak Bay, in the district of Alaska, and the region within 500 yards of the mouth of said Wood River be closed to all commercial fishing, and that all commercial fishing be prohibited in Nushagak River proper."

The earliest fishing by whites in the Bristol Bay section was for salting purposes by the trading companies, more particularly the Alaska Commercial Co., which had an important station at Fort Alexander on Nushagak Bay. Petroff, in the census report of 1880, refers to exports from this section of "from 800 to 1,200 barrels of salted salmon per annum from the Nushagak River."

In 1883 the schooner *Neptune* visited the Nushagak on a salting trip. The next year the Arctic Packing Co. erected a cannery here and made a trial pack of 400 cases. This was the first cannery to operate in Bering Sea. It was located close to the Moravian mission. This cannery eventually became a member of the Alaska Packers Association, and has not been operated for several years.

The second cannery to be built was by an Astoria company, the Alaska Packing Co., and it was erected on the western side near the head of the bay and about 1½ miles below the mouth of the Wood River. It has been operated every year to date, being since 1893 a member of the Alaska Packers Association. It is popularly known as the "Scandinavian" cannery.

In 1886 the Bristol Bay Canning Co. was organized by San Francisco parties, and built a cannery on the western shore of Nushagak Bay in a bend about 2 miles below the cannery of the Alaska Packing Co., at a place called Dillingham. It became a member of the Alaska Packers Association in 1893 and was operated each year until 1907. A couple of years later it was dismantled. This plant was popularly known as the "Bradford" cannery.

The Nushagak Canning Co. built a cannery on the eastern shore of Nushagak Bay in 1888, at a place known as Clark Point, 5½ miles below Fort Alexander. This cannery also became a member of the Alaska Packers Association in 1893, but from 1891 to 1901 was not operated, but held in reserve. In the last named year a large double cannery was built here and put into operation and has been operated each year since.

This company also built and operated a saltery on the Igushik River in 1886. Three years later it was moved to the mouth of the Nushagak. In 1893 C. E. Whitney & Co. purchased an interest in it and by 1899 owned it all. In 1902 the saltery was sold to the Alaska Packers Association, which closed it down.

In 1899 the Pacific Steam Whaling Co. built a cannery and commenced canning on the eastern shore of Nushagak Bay at Fort Alexander, or Nushagak village. This cannery was purchased by the Pacific Packing & Navigation Co. in 1901 and upon the sale of its properties in 1904 became a part of the Northwestern Fisheries Co. It has been operated each year since the latter company acquired it.

The same year the Alaska Fishermen's Packing Co., of Astoria, built a cannery immediately below that of the Pacific Steam Whaling Co., and operated it every year to date, control of the company passing to Libby, McNeill & Libby in 1913.

In 1901 the Columbia River Packers' Association, the Alaska-Portland Packers Association, and the Alaska Salmon Co., all built canneries on the Nushagak and have operated them to date, except the last named in 1909, when its supply ship was wrecked. The Alaska Fishermen's Packing Co. also built a saltery here. The latter plant was abandoned in 1904.

In 1903 the North Alaska Salmon Co. operated a new cannery on the Nushagak, a few miles below Clark Point.

In 1910, on August 10, shortly after the packing season had ended, the plant of the Alaska-Portland Packers Association was completely destroyed by fire. The plant was rebuilt in time to operate the next season.

KVICHAK RIVER AND BAY.

The Kvichak River is about 80 miles in length, varies from 100 yards to a mile in width, and discharges a vast quantity of water. The influence of the tide is felt 30 miles from the mouth. The current is very swift, running in places as much as 7 miles an hour. The upper half of the river is filled with low, grassy islands, the channels in many places being quite narrow. A launch drawing 3 feet of water can reach Lake Iliamna with very little difficulty. In most sections there are over 2 fathoms of water in the channels. The river drains Iliamna Lake, the largest lake in Alaska, which is about 90 miles long and about 30 miles wide, and Lake Clark. There are a number of Indian villages along the shores of the river and lakes.

Practically all of the fishing here is carried on in Kvichak Bay, gill nets being the favorite form, with also a couple of traps set in the lower part of the river. As it is not convenient for the fishermen to bring the catch to the canneries, large house lighters and scows are moored in convenient places and the fishermen live aboard the former, while the fish are put aboard the latter and taken to the canneries by the run boats. The numerous shoals in the bay seriously impede both fishing and navigation.

The first fishing operations on the Kvichak were in 1894, when the Prosper Fishing & Trading Co. and the Alaska Packers Association each established a saltery and operated that year and in 1895; in 1896 the latter purchased the plant of the former and consolidated the two.

In 1895 the Point Roberts Packing Co., which was owned by the Alaska Packers Association, built a cannery at Koggiung, the site of the former saltery, and operated it the next year.

In 1900 there was a considerable development in this region. The Kvichak Packing Co., owned by the Alaska Packers Association, built a cannery on the northern point of entrance to Bear Slough, while the North Alaska Salmon Co. built two canneries about 1,000 feet apart on the left bank of the Kvichak, about 6 miles above Koggiung.

The latter company built a cannery at Hallerville on the Alagnak River, a tributary of the Kvichak, in 1904. In 1913 a large new cannery to take the place of the Hallerville plant was built on the lower side of Pedersen Point, lower down on Kvichak Bay.

The second plant of the Alaska Packers Association, known as the Coffee Creek plant, was burned down in 1906. It was rebuilt in 1908 and operated again in 1909, and has been operated continuously ever since.

In 1904 the Union Packing Co. established a cannery on the left bank a little distance above the canneries of the North Alaska Salmon Co., having moved this plant from its original location on Kell Bay, in southeast Alaska. It was operated until 1907, when it was abandoned.

About 1905 the Northwestern Packing Co. built a saltery on the east side of the bay. In 1908 it was sold to and operated by Nelson, Olsen & Co., who in 1910 sold it to the Alaska Fishermen's Packing Co., which the following year turned it into a cannery. In 1913 Libby, McNeill & Libby bought this and the Nushagak plant, and continued to operate them under the old name.

NAKNEK RIVER.

But little is known of the Naknek River for more than 10 or 15 miles from its mouth. It is said that the river is about 60 miles long, and has its rise in a lake which is of considerable size. With the exception of a short series of rapids, up which it is possible to haul a boat with a rope from the shore, the river is navigable for small craft. Shoals and banks, many of which uncover at low water, are abundant in the lower course of the river.

Red salmon is the principal species entering this river, although all the other species are to be found here in lesser abundance. They appear here a little later than in the Nushagak Bay. Only gill nets are used in fishing.

The first commercial fishing on the Naknek River was in 1890, when the Arctic Packing Co. built and operated a saltery on the east bank about 4 miles from the mouth. This plant was sold to the Alaska Packers Association in 1893, and the next year the latter built a cannery here, and made the first pack in 1895, and has operated it every year since. Ultimately the saltery was merged with the cannery.

In 1901 the association built another cannery about a mile nearer the mouth, and in 1911 still another was built close to the mouth.

In 1890 L. A. Pedersen built and operated a small saltery on the right bank about 3 miles from the mouth. In 1894 the Naknek Packing Co. purchased the saltery and erected a cannery a short distance above. This saltery and another built on the shore of Kvichak Bay in 1897 were operated for some years. In 1907 the latter was turned into a cannery and operated by Mr. Pedersen under the name of the Bristol Bay Packing Co. The Naknek Packing Co. cannery has been operated to date.

In 1916 the Red Salmon Canning Co. built and operated a cannery between the plants of the Naknek Packing Co. and the Bristol Bay Packing Co.

UGAGUK RIVER.

According to the natives this river, which is frequently called the Egegak, or Igagik, is about 80 miles long from the mouth to Lake Becharof, at the head. The lake itself is about 45 miles long and 15 miles wide. The river is navigable for small boats to within 10 miles of the lake, whence there is a succession of rapids, around which it is necessary to portage. The lower part of the river has numerous shoals, some of which are exposed at low water. King Salmon River, the principal tributary, enters about 7½ miles from the mouth.

The red salmon is the principal species, although all the other species are found in much lesser abundance. Gill nets alone are used here.

In 1895 the Alaska Packers Association established a fishing station on the right bank about 5 miles from the mouth and operated as a saltery until 1900, when the apparatus was moved to the cannery site.

In 1899 the Alaska Packers Association, under the name of the Egegak Packing Co., commenced building a cannery on the left bank opposite and a little above the salting station. This plant was finished in 1900 and packs were made that year and each succeeding year except 1905 and 1906.

In 1903 the North Alaska Salmon Co. built and operated a cannery on the opposite shore from the Alaska Packers Association, and has operated it each year to date.

UGASHIK RIVER.

This river has its rise in a chain of two lakes, but with the exception of that portion below the upper cannery, about 25 miles, it is very little known to the whites. The river is very tortuous in its course. It has two known tributaries—King Salmon River, which enters through the left bank about 17 miles from the bar at the mouth, and Dog Salmon River, which enters through the left bank about 37 miles from the bar. From Smoky Point to the capes at the mouth the river widens very greatly, being about 20 miles across at the mouth. Shoals are numerous, but there is a channel with about 9 feet at low water.

This river is essentially a red salmon stream, but the other species are also taken in small numbers, although the humpback is very scarce. This river is noted for the great falling off in the run of red salmon of recent years, 769,002 red salmon being taken in 1901, 1,640,973 in 1902, 1,703,536 in 1903, 564,492 in 1904, 432,779 in 1905, and 152,140 in 1906. Since 1906 the run has not improved. Gill nets are used here.

C. A. Johnson was the first man to operate commercially on this river, having erected a saltery on the left bank, about 23 miles above Smoky Point, in 1889, and operated it continuously from 1889 to 1898, both inclusive. This saltery was merged in the cannery of the Bering Sea Packing Co. In 1894 Mr. Johnson established and operated another saltery on the right bank of the river, about 12 miles from the bar, which he sold in 1899 to the Alaska Packers Association, who absorbed it in their cannery plant.

The Bering Sea Packing Co., a branch of the Alaska Improvement Association, in 1890 built the first cannery on the river, this being located on the left bank near the first Johnson saltery. A small pack was first made in 1891. The plant was closed in 1892 and 1893, and as the location had proven far from suitable, it was, in 1894, moved to a point on the left bank, about 15 miles above Smoky Point, where it was operated until 1896. The next year it was sold to the Alaska Packers Association. The machinery and equipment were utilized in the latter company's cannery, and the old location abandoned.

In 1893 Charles Nelson established a saltery on the left bank of the Ugashik, immediately above the last site of the Bering Sea Packing Co. It was operated in 1893 and 1894, and then sold to the Alaska Packers Association, who closed it down.

In 1893 the Alaska Packers Association also built a saltery on the left bank of the river about a mile below the last site of the Bering Sea Packing Co. It was operated each year until 1895, when it was merged into the association's cannery.

In 1895 the Alaska Packers Association built a cannery, known as the Ugashik Fishing Station, on the right bank of the river immediately above the pilot station, which is about 12 miles from the bar. It made the first pack in 1896 and packed every year until 1907, when it was closed. In 1906 its outfit was destroyed in the San Francisco fire, and it was decided to operate it as a saltery, but the burning down of the Coffee Creek cannery of the association on the Kvichak, caused a change in the plans, and a part of the saved outfit of the latter was sent to the Ugashik and the plant operated as a cannery.

The Bristol Packing Co. built a cannery on the left bank of the river about 25 miles from Smoky Point in 1900. A pack was made the same year and the plant operated continuously until 1906, when it was shut down, and a small salting crew operated a portion of the plant. Eventually the plant was dismantled without operating again as a cannery.

In 1901 the Alaska Packers Association built and put into operation another cannery about 15 miles up the river from the other one. In 1906 this plant was shut down and eventually it was dismantled.

In 1901 the Red Salmon Canning Co. also built and operated a cannery still farther up the river and has operated it continuously to date.

KUSKOKWIM RIVER.

This, one of the great rivers of Alaska, has been but little exploited as yet. Very little accurate data have been obtainable about the river until within the last couple of years, and this relates mainly to the bay and a few miles of the adjacent river, which the United States Coast and Geodetic Survey has charted.

We know that the river has considerable runs of salmon, but usually ice conditions have been such in the spring that a cannery crew frequently could not get in in time to prepare for the run. In 1906 a salting outfit was sent here by Seattle dealers, but arrived too late for the run of fish. The outfit was cached at Bethel.

During the last three years some mild curing of king salmon has been carried on here, but the lack of cold storage, both ashore and on the vessels operating to and from the river, has prevented any considerable development of this industry.

ARCTIC OCEAN.

Although it is known that there are good runs of salmon in some of the rivers debouching into the Arctic, the ice and other conditions have deterred people from attempting to extend their operations into this region. In 1912, however, the Midnight Sun Packing Co. built and operated a small cannery on Kotzebue Sound, in the Arctic Ocean. A small pack, mostly of Dolly Varden trout, was made in that and subsequent years.

BRITISH COLUMBIA.[a]

Fraser River.—This, the largest river in British Columbia (it is over 1,000 miles in length), has been important from a fishery standpoint ever since salmon canning was taken up as a commercial proposition.

The Hudson Bay Co. was the first to engage in the preparation of salmon for commercial purposes; the company bought the fish from the Indians and pickled them in barrels for export, mainly to the Hawaiian Islands and Asia. At times this export amounted to as much as 4,000 barrels a year. The company claimed a monopoly of the fisheries, but with the revocation of its license in 1858 this claim fell. Several salteries were subsequently established on the Fraser River by whites.

In the early sixties some canned salmon was prepared in a small way for local use, but the industry was not taken up commercially until 1867, when Ewen & Wise started at New Westminster. In 1870 Deas & Co. started at Deas Island. Of these two the only one to continue was Ewen & Co., who had succeeded Ewen & Wise, and they continued in business until they sold out to the British Columbia Packers' Association in 1902.

In 1872 Holbrook & Co. purchased a small cannery which had been started at Sapperton by Capt. Stamp sometime before, and operated it for a few years.

In 1876 there were three canneries running, consisting of Holbrook & Co., Ewen & Co., and the British Columbia Canning Co. (Deas Island).

The following year this was increased by English & Co. and Finlayson & Lane, the latter quitting after one season, being succeeded in 1878 by Lane, Pike & Nelson. King & Co., the British Columbia cannery (Annieville), and the Delta cannery also commenced operations the latter year.

In 1879 Holbrook & Co., and Lane, Pike & Nelson dropped out, and Haigh & Sons (succeeded in 1884 by the Bon Accord Packing Co.) commenced operations.

King & Co. were burned out in 1880, and Adair & Co., afterward known as the Wellington Packing Co., commenced. A year later Laidlaw & Co. commenced operations.

In 1882 the British Union Packing Co., afterwards known as the Harlock Packing Co., commenced packing salmon. The British-American cannery and J. H. Todd & Sons (Richmond cannery) also began operations.

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[a] The author is indebted to Henry Doyle, of Vancouver, British Columbia, for practically all of the historical data relating to the canning industry of British Columbia, and hereby expresses his deep appreciation for this and many other courtesies.

Joseph Spratt started a floating cannery, known as "Spratt's Ark," in 1883; he retired at the end of two years. E. A. Wadhams also began operations in 1883. In 1887 the Holly cannery was built on Lulu Island opposite Deas Island. The high water of June, 1894, partly destroyed it and the site was abandoned.

No more additional plants were built until Hobson & Co. started in 1889. The Canoe Pass Canning Co. also started the same year, as did J. H. Todd & Sons with their Beaver cannery.

The Anglo British Columbia Packing Co. was formed in 1891, taking over the canneries formerly operated by the British Columbia Packing Co. (old Annieville plant), E. A. Wadhams, British-American Packing Co., Canoe Pass Canning Co., Duncan & Batchelor (Britannia cannery), and English & Co. (Phoenix cannery).

In 1892 the Terra Nova Canning Co. began operations, and the next year the Lulu Island Canning Co., Steveston Canning Co., Pacific Coast Packing Co., Canadian Pacific Packing Co., Short & Squair, and Butimar & Dawson (at Steveston), all commenced operations.

In 1894 the Gulf of Georgia Canning Co., Dinsmore Island Canning Co., Sea Island Packing Co., and the Fishermen's Packing Co. all built and began to operate canneries.

The Alliance Canning Co., Atlas Canning Co., Boutiliar & Co., and the Star Canning Co. commenced operations in 1895.

There was considerable development in 1896, when the Anglo-American Canning Co., Fraser River Industrial Co., Hume & Co., Provincial Canning Co., Westham Island Packing Co., Westminster Packing Co., and the Vancouver Packing Co. all started canning.

In 1897 the Premier Canning Co., Sinclair Canning Co., Western Fisheries, Cleve Canning Co., Welsh Bros., Currie, McWilliams & Fowler, Butimar & Dawson (at Canoe Pass), Colonial Canning Co., and the Fraser Canning Co. all began operating.

The English Bay cannery was added to the list in 1898, but the Sinclair Canning Co. and Western Fisheries plants were both destroyed by fire at New Westminster and not rebuilt. The plant of the Steveston Canning Co. was absorbed that year by the Federation Brand Salmon Canning Co. and the cannery renamed the "Lighthouse" cannery.

In 1899 the Greenwood Canning Co., Scottish Canadian Canning Co., St. Mungo Canning Co., Wurzburg & Co., and Acme Canning Co. all began active operations, while in 1900 the Great Northern Canning Co. was the only addition to the list. In 1900 the United Canneries (Ltd.) was formed to take over the Gulf of Georgia, English Bay, and Scottish Canadian plants, and the Canadian Canning Co. this year also absorbed the Star, Fraser, and Vancouver canneries. In 1901 the National Packing Co. built at Eagle Harbour.

Like the other canning sections, British Columbia suffered in 1901 from an oversupply of canned salmon, due to the large number of plants which had been erected and which were producing more salmon than market could be found for. At this juncture the British Columbia Packers Association was formed. It embraced 29 out of the 48 plants on the Fraser River and 12 of those situated in Northern British Columbia waters, including the following plants: Ewen & Co., Delta, Harlock, Wellington, Lulu Island, Terra Nova, Pacific Coast, Canadian Pacific, Short & Squair (Imperial cannery), Brunswick canneries at Steveston and Canoe Pass, Dinsmore Island, Sea Island, Fishermen's Packing Co., Reliance Cannery, Atlas Cannery, Boutiliar & Co., Hume & Co., Anglo-American, Provincial, Westham Island, Westminster Packing Co., Premier, Cleve, Welsh Bros., Currie, McWilliams & Fowler, Colonial, Greenwood, Wurzburg & Co., and the Acme Canning Co. In 1914 the corporation style was changed to the British Columbia Fishing & Packing Co., Ltd.

In 1905 the Burrard Canning Co., Steveston Canning Co., Butimar & Dawson, Unique Cannery, and the Vancouver Fish & Canning Co. were all built and operated. The latter was burned in the middle of the season. The following year the Great West Packing Co. cannery was built at Steveston; the Nye Canning Co. operated for part of the season on False Creek in Vancouver, and the Capital City Canning Co. built a plant at Victoria.

Skeena River.—The first cannery to be built on the Skeena River was in 1877, when a man named Neill built one at Inverness. In 1878 the Windsor Canning Co., consisting of Henry Saunders, W. H. Dempster, and John Wilson, of Victoria, established a cannery at Aberdeen.

There were no additions until in 1883, when the Balmoral cannery, the British-American, and Robert Cunningham canneries were started.

In 1889 the North Pacific was started and in 1890 the Standard. In 1891 the Anglo British Columbia Packing Co. bought the British-American cannery and the North Pacific Canning Co. cannery. In 1892 the Claxton, and in 1895 the Carlisle, canneries were built. The Peter Herman (afterwards the Skeena River Commercial Co.) and Turnbull canneries were built in 1900. The last named operated only four seasons.

In 1902 the British Columbia Packers Association acquired the Balmoral, Cunningham, and Standard canneries.

In 1903 the Cassiar cannery was built. The next year the Alexandria Packing Co. was started. It was later acquired by the British Columbia Packers Association, as was also the Dominion cannery, which was built in 1906.

There have been no additions to the canneries on this river since 1906.

Rivers Inlet.—The first cannery to be built and operated on Rivers Inlet was in 1881 by Shot, Bolt & Draney, afterwards the British Columbia Canning Co. The Wannuck cannery was built in 1884, the Good Hope in 1895, the Brunswick in 1896, the Wadhams and the Vancouver in 1897.

There were no changes until 1902, when the British Columbia Packers Association acquired the Wadhams, Brunswick, Wannuck, and Vancouver, the two latter being dismantled and the two former enlarged correspondingly.

In 1906 the Beaver cannery was built by J. H. Todd & Sons, the Kildalla cannery by the Kildalla Packing Co., and the Strathcona cannery by Bain & Wilson, the latter afterwards being acquired by the Wallace Fisheries (Ltd.).

Nass River.—The first cannery to be built on the Nass River was by Henry Croasdale in 1881, and it operated for four years. The Douglas Packing Co. built a cannery here in 1882 and operated it for two years. Both were then shut down owing to the fact that the locations were too far up the river for steamers to move the packs. In 1888 the plants were dismantled and removed to Nass Harbor and Mill Bay, respectively. In 1889 the Cascade Packing Co. commenced operations, but the plant was dismantled in 1893.

In 1903 the Pacific Northern cannery was built near the mouth of Observatory Inlet, and in 1905 it was purchased by John Wallace, who moved it to Arrandale. In the latter year the Port Nelson Canning & Salting Co. started. In 1908 the Mill Bay cannery was purchased by the Kincolith Packing Co. In 1911 the Arrandale and Port Nelson canneries were bought by the Anglo British Columbia Packing Co., and in the following year the Nass Harbor cannery was bought by the British Columbia Packers Association.

Vancouver Island.—The first cannery to be built on Vancouver Island was the one on Clayoquot Sound, which was built in 1895 by the Clayoquot Sound Canning Co. The Alberni Packing Co. cannery on Alberni Canal was first operated in 1903. In 1905 J. H. Todd & Sons built a cannery at Esquimault Harbor, as did also the Capital City Canning Co. the same year.

Alert Bay.—The Alert Bay cannery of the Alert Bay Canning Co. was opened in 1881.

SALMON FISHING IN THE HEADWATERS.

Considerable salmon fishing is carried on in the headwaters of certain of the larger rivers of the coast, of which no account appears in the data of the commercial fisheries. This is due to the fact that the fishing is usually of a desultory character, the fisheries are few in number and scattered widely, and while the catch in the aggregate is considerable it does not amount to much in any one spot.

The Columbia River is a typical example of such a stream. Commercial fishing is usually considered as ending at Celilo, about 150 miles from the mouth. As a matter of fact, salmon fishing for market or for home use is carried on to a considerable extent along the main river and also on the Snake and the Yakima, tributaries of the Columbia. In nearly all cases hook and line and spears are used alone, but on the Snake River, near Lewiston, in Idaho, are several rather important haul-seine fisheries. Fishing is carried on at these places in the spring for steelhead trout and in the fall for chinook and silver salmon and steelhead trout. As many as 25 salmon have been taken at one time. While this may seem a small number to one habituated to the large catches farther down the river, in the aggregate it amounts to a considerable quantity.

Considerable local fishing is carried on along the various Oregon streams above the sections usually fished by commercial fishermen. Most of this is done by ranchers living along the streams, and while by far the greater part is for home consumption a small proportion is sold.

On the Yukon River and its tributaries considerable salmon fishing is prosecuted. Much of this is done by natives for the use of themselves and their dogs, but at places white fishermen operate for a portion of the year and sell their catches in near-by settlements or at the mining camps. No effort has ever been made to secure statistics of the extent of this fishery.

III. APPARATUS AND METHODS OF THE FISHERIES.

GILL NETS.

The gill net is the oldest and most popular form of apparatus in use in the salmon fisheries of the Pacific coast. There are two kinds, drift and set, these names clearly expressing the difference between them. Fine flax or linen twine is generally used in their manufacture, although in some places cotton twine is employed, and it has usually 12 threads and is laid slack. They are hung in the ordinary manner—to a rope with cork floats to support the upper portion of the gear, and to a line with lead sinkers attached, which keeps the net vertical in the water and all its meshes properly distended. The nets are tanned, usually several times each season.

Drift nets vary greatly in length and depth, depending upon the width of the fishing channels, the depth of water, etc. On the Sacramento River they average about 300 fathoms in length, are 45 meshes deep, and have a stretch mesh of from 7½ to 9½ inches. On the coastal rivers of Oregon these nets average about 125 fathoms in length, and are about 36 meshes in depth, the mesh varying with the species of salmon sought. On the Columbia River the nets average about 250 fathoms in length and have a stretch mesh for chinooks of 9 to 9½ inches. On the Willamette River, the principal tributary of the Columbia, they average about 75 fathoms in length, with meshes of 8 and 9½ inches. On Willapa Harbor drift gill nets run from 100 to 250 fathoms in length, are 30 meshes deep, with stretch meshes of 7 and 8½ inches. On Grays Harbor they average 100 fathoms in length, the chinook nets run from 24 to 45 meshes in depth, with a stretch mesh of 9 inches, while the silver or coho nets are 35 meshes in depth, with a stretch mesh of 7 inches. In the Puget Sound region the nets average 300 fathoms in length, with meshes suitable for the particular species sought. In Alaskan waters the nets vary greatly in length and depth, depending upon the places where fished.

Drift gill netting is prosecuted chiefly in the estuaries of the rivers in and near the channels. If the water is clear the nets are set only at night, but should the water be muddy or discolored with glacial silt, fishing can be carried on either night or day. Night fishing is most common in the States, while day fishing is most common in Alaska. When fishing in rivers it is necessary to work in a straight stretch of water of fairly uniform depth and free from snags or sharp ledges, these being called "reaches."

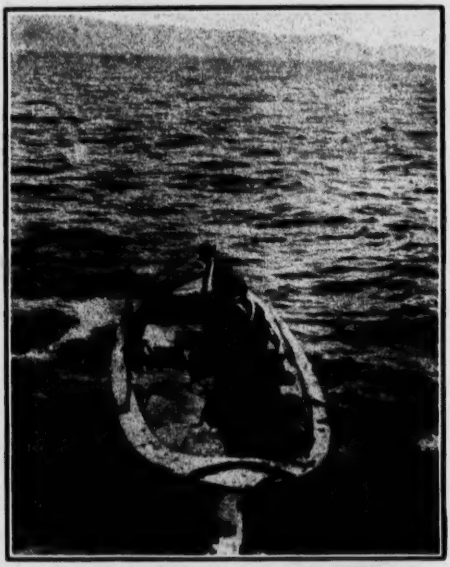


FIG. 1.—COLUMBIA RIVER POWER GILL NET BOAT.

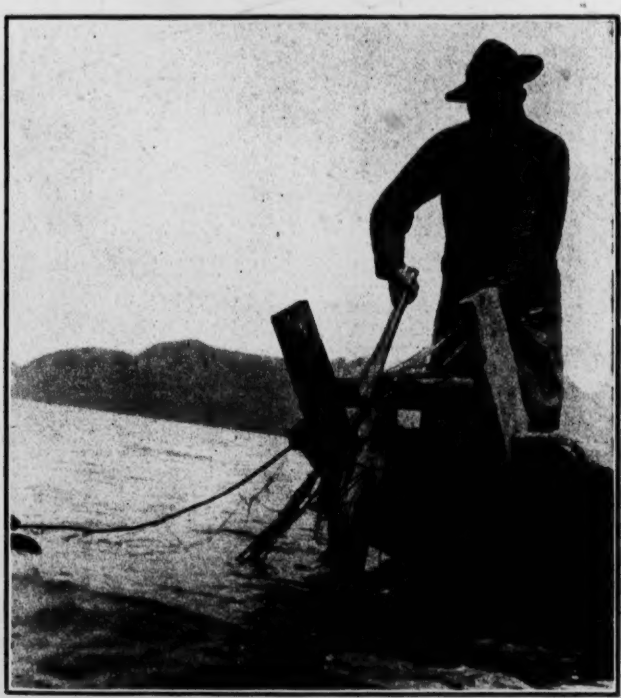
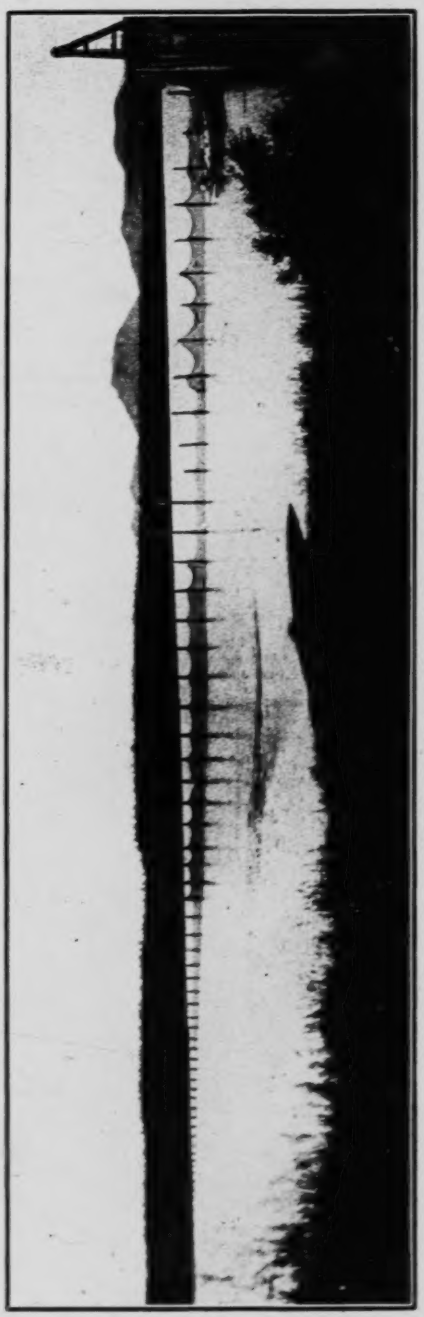


FIG. 2.—REMOVING THE SALMON FROM A GILL NET.

PLATE V.



SALMON RACK ACROSS WOOD RIVER, ALASKA.

In setting the net the boat puller rows slowly across the stream while the other man pays out the apparatus, to the first end of which a buoy has been attached. When about two-thirds of the gear is out, the boat is turned downstream at nearly right angles to her former course, so that the net, when set, approximates the shape of the letter L. The net is laid out at nearly right angles or diagonally to the river's course, so that it will intercept the salmon that are running in, and is usually put out about an hour before high-water slack and taken in about an hour after the turn of the tide. In Alaska the fishermen usually fish on both the high and low slack. The nets are allowed to drift for the time specified, the fishermen drifting along at one end, then the net is hauled into the boat over a wooden roller fixed in the stern, and the fish, which have become gilled in the meshes, are removed, stunned or killed by a blow on the head, and thrown into the bottom of the boat.

Set gill nets are made in the same way as drift nets, in many instances being fragments of the latter, and are usually operated in the upper reaches of the rivers. They vary in length from 10 to 100 fathoms, from 35 to 65 meshes in depth, and have the same sizes of meshes as the drift nets, the size varying, of course, with the species sought for. Sometimes these nets are staked, sometimes anchored, while occasionally only one end is tied to the shore or a stake set in the water.

On the flats off the mouth of the Stikine River, in southeast Alaska, a combination of the drift and set method is followed. A double set of stakes, about 6 feet apart, are set out from the shore for a distance of several hundred yards. An hour or two before slack water the fishermen pay out the net parallel to the line of stakes and about 50 feet from them. The tide drifts the net down until it is caught against the stakes, which retain it until slack water, when the fisherman takes it up and repeats from the opposite direction on the next turn of the tide.

HAUL SEINES.

On the Columbia River, where this form of apparatus plays a prominent part in the fisheries, the nets vary in length from 100 to 400 fathoms; the shallowest end is from 35 to 40 meshes deep, but it rapidly increases in width and is from 120 to 140 meshes deep at the other wing. The "bunt," or bag, in the central part of the net is about 50 fathoms long. These nets are usually hauled on the numerous sand bars which are a very noticeable feature of the river at low tide. Buildings are erected on piles on these sand flats, in which the men and horses take refuge at high tide, when the bars are covered with water. Operations begin as soon as the beach or bar uncovers, so that the men can wade about. The net is placed in a large seine boat, with the shore end attached to a dory. At the signal the seine boat is headed offshore, while the dory heads toward the bar. As the seine boat circles around against the current the net is paid out in the shape of a semicircle. The dory men hurry to the bar with the shore end of the net, the idea being to get that in as soon as possible in order to prevent the escape of the salmon in that direction. As soon as this has been accomplished, the outer shore line is brought to the bar, when several horses are hitched to the line and begin to haul in the net, care being taken by the men to work it against the current as much as practicable, and to get it in as speedily as they can in order to prevent the escape of salmon either by jumping over the cork line or finding some outlet below the footrope or lead line.

The only other place on the coast where haul seines are important is at Karluk, on Kodiak Island, in Alaska. Here the seines are hauled upon the narrow gravel spit dividing the lagoon from the strait, and practically the same method is followed as in the Columbia River.

DIVER NETS.

These are in use in the Columbia River, mainly throughout the middle and upper portions of the river. They vary from 100 to 200 fathoms in length and are used almost exclusively for chinook salmon. In construction they somewhat resemble a trammel net. Two nets are attached together side by side. The outer one, or the one toward the oncoming fish, has a larger mesh than the other, so that if the fish manages to pass through the first, it will be caught in the smaller meshes of the second.

DIP NETS.

These consist of an iron hoop secured to the end of a stout pole with a bag-shaped net fastened to the hoop. They are generally used at the cascades on the rivers, small platforms being erected upon which the operator stands while fishing. Indians formerly used them to a large extent, but, owing to the steady decline in the number of Indians, and the appropriation of favorable spots by the whites for other forms of apparatus, they are but little used now.

SQUAW NETS.

This type is virtually a set net. It consists of an oblong sheet of gill netting, about 12 feet long and 8 feet deep, its lower edge weighted to keep it down, and its upper edge attached to a pole that floats at the surface, and is held by a line or lines to another projecting pole which is securely fastened to the shore, so that it will not swing around with the strain of the swift current on the net. A single block is attached to the pole, and through this passes a rope,

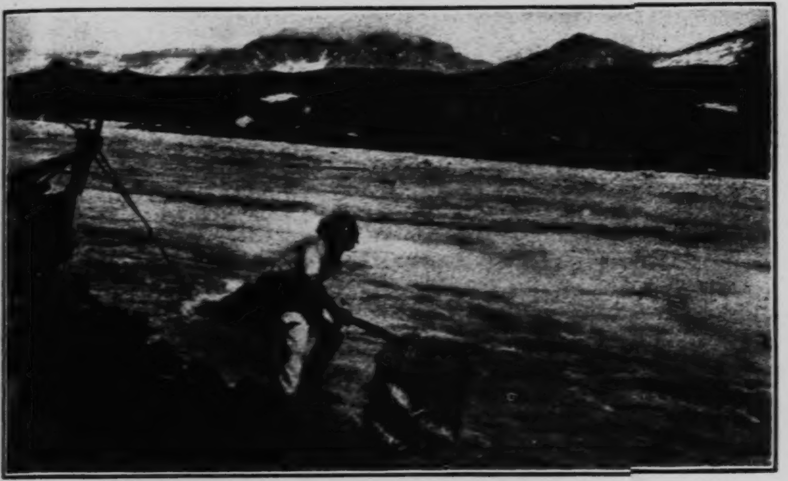


FIG. 1.—DIPPING SALMON FROM THE COPPER RIVER, ALASKA.

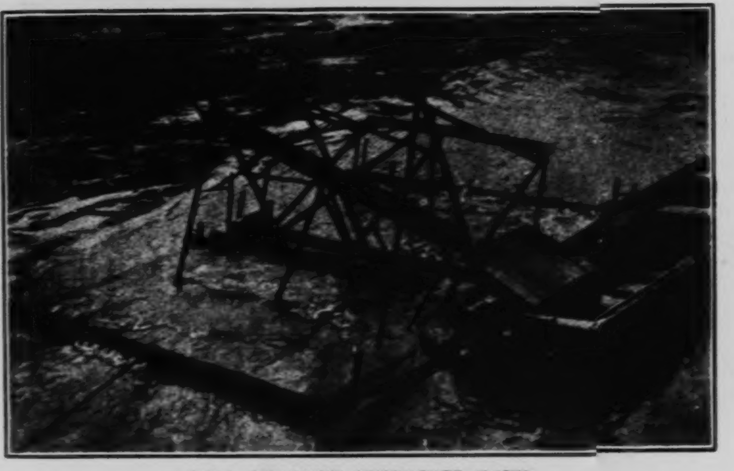


FIG. 2.—FISH WHEEL, YUKON RIVER, ALASKA.

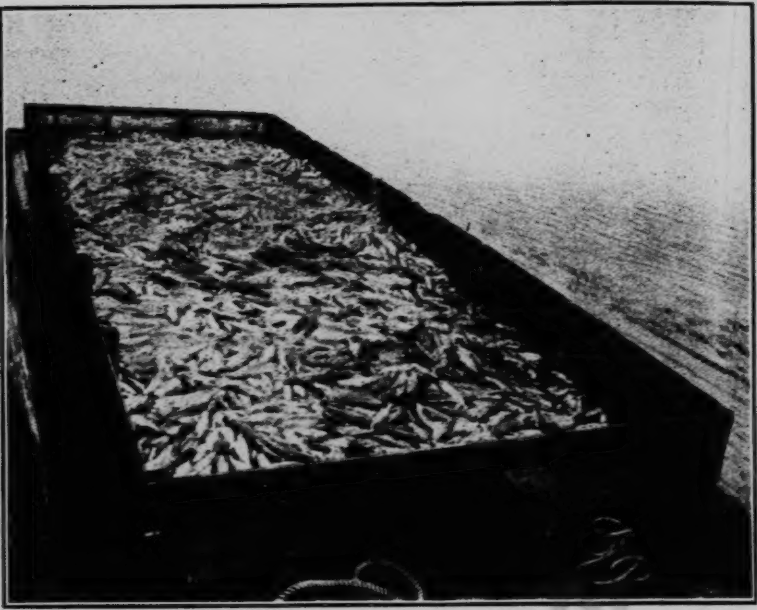


FIG. 1.—A SCOW LOAD OF SALMON.

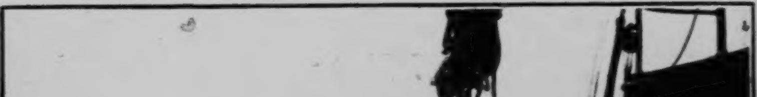


FIG. 2.—PURSE SEINE CREW DELIVERING FISH TO CANNERY TENDER.

thus making a tackle for the more convenient manipulation of the net. The dip-net fishermen of the Columbia River use this net, which derives its name from the fact that it used to be commonly operated by Indian squaws for taking salmon. But few are now in use, for the same reasons as given for the decline in the use of dip nets.

PURSE SEINES.

This form of apparatus is in quite general use in Puget Sound and southeast Alaska, and has proved highly effective in these deep, swift waters. These seines are about 200 fathoms long, 25 fathoms in the bunt, and 20 fathoms in the wings, all with a 3¾-inch stretch mesh. The foot line is heavily leaded and the bridles are about 10 feet long. The purse line is made of 1½-inch hemp. The rings through which the purse line is rove measure about 5 inches in diameter and are made of galvanized iron.

Purse seining for salmon in Puget Sound and waters north of same is one of the most important methods in use in the fisheries. In the type of vessel used in this fishery there has probably been greater improvement than in any other branch of the fisheries of the coast. In the early days row scows were in use, but now vessels with power are used.

In 1903 the first gasoline-powered purse seine boat appeared on the Pacific coast salmon fishing grounds in Puget Sound. The vessel was named the *Pioneer* and she was equipped with a 5-horsepower engine. The first season she easily demonstrated her vast superiority over the other purse seiners in the quickness with which she could reach a school of fish after it was sighted and in surrounding it with her seine. The next year there were a few more built or equipped, and the number has steadily increased until at the present time practically all except a few in southeast Alaska are equipped with motor engines.

The first power seine boats were only about 30 feet in length and had small power. As they were few in numbers, there was virtually no competition, and high power and speed were not a necessity. As the boats increased in numbers, however, competition became keener, and the first types of boats with their small power were quickly thrown into the shade by the newer types, which averaged between 45 and 55 feet in length, with 45 to 75 horsepower engines.

When motive power was introduced in the vessels, it was natural that the fishermen should soon introduce winches for the purpose of hauling in the nets, as the whole work could then be done by the one engine.

The purse seine vessels are built with rounded sterns. On an elevated section of the stern is set a movable platform on a pivot.

The after end of this platform has a long roller. The purse seine is stowed on this platform, the head rope with corks on one side and the foot line on the other, so that there will be no tangling when the seine is paid out.

When the lookout sights a school of fish, the seiner is run down close to it and a rowboat launched. One man takes his place in this with the rope from one end of the seine and acts as a pivot, while the seiner circles around the school, the crew paying out the seine as she moves along. When it is all out, the vessel runs alongside the rowboat and takes aboard the other rope. Attaching this and the rope from the other end to the power winch, the circle around the fish is rapidly narrowed, and the slack of the seine as it comes in is stowed back on the platform. Around the bottom of the seine and through galvanized iron rings about 5 inches in diameter, runs the purse line. As this is hauled into the boat, the open space at the bottom is rapidly closed up just as a handbag would be through the drawing together of the pursing string at the top. During this operation the nonpower purse seiners have a man standing alongside the rail who throws a pole into the center in order to drive the fish away from the open section. He is so skillful in this work that almost invariably the pole comes back to his hand as the pressure of the waters forces it up again. When the bottom has been pursed up the fishermen hauling by hand can move more leisurely, but with the power winches in use the hauling in of the net is a comparatively easy matter, and the pole thrower is dispensed with.

When all the fish are in the bunt and the latter alongside, the fish are generally dipped out by means of a dip net balanced on the end of a tackle. A fisherman lowers it into the seine, scoops up a load of salmon, and as the net is hauled up, guides it over the vessel, and then trips it and dumps the fish into the hold.

The Puget Sound purse seiners meet the salmon off the entrance to the Strait of San Juan de Fuca and follow the sockeyes till they have passed out of American waters, what are known as the Salmon Banks, off the lower end of San Juan Island, being the principal rendezvous during the run of sockeyes. After this run is over they go up the Sound and fish for dogs and cohos, and later go to the head of the Sound and fish for dogs, cohos, chinooks, and steelhead trout. In southeast Alaska they follow the fish all over the bays, straits, and sounds of that section. Purse seines are used in a few other places, but the fishery is secondary to those with other forms of apparatus.

This style of fishing is said to have been introduced on Puget Sound by the Chinese in 1886.

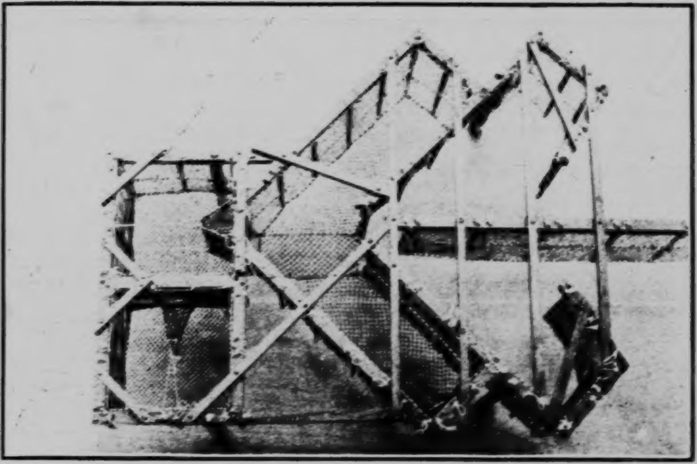


FIG. 1.—FLOATING TRAP NET.

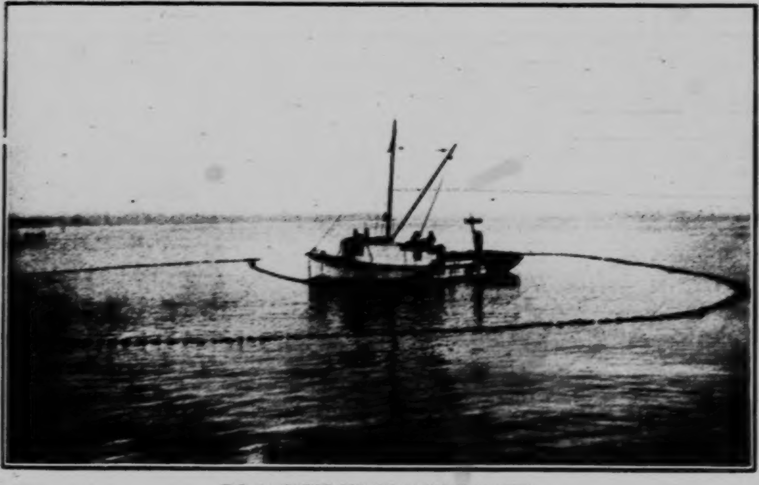


FIG. 2.—PURSE SEINER HAULING IN NET.

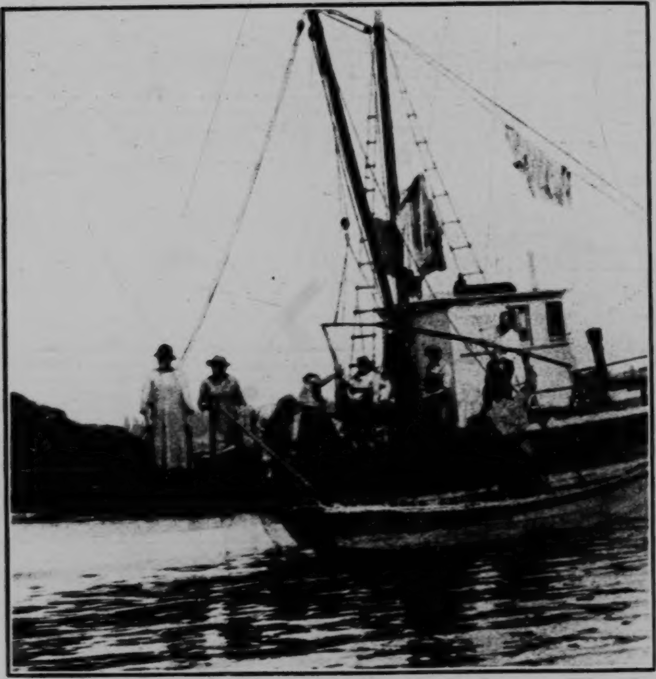


FIG. 1.—DIPPING THE SALMON FROM THE PURSE SEINE.

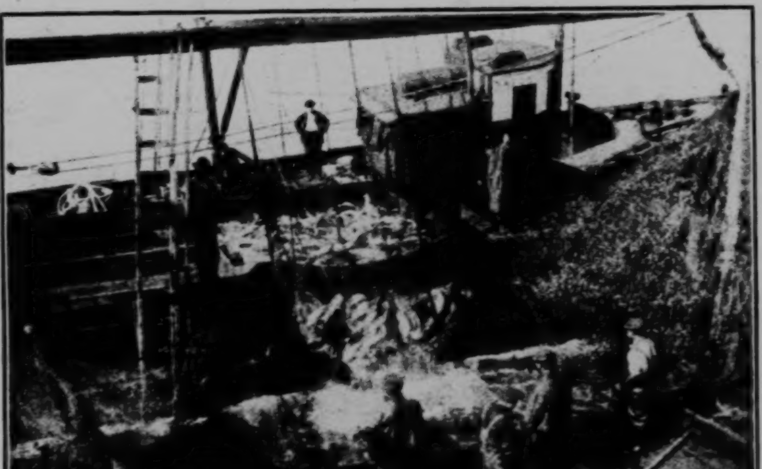


FIG. 2.—BRAILING THE SALMON FROM THE TRAP NET.

TRAPS OR POUND NETS.

A trap is stationary and consists of webbing, or part webbing and part wire netting, held in place and position by driven piles. This piling usually is held together above water by a continuous line of wood stringers, also used to fasten webbing to or to walk on if necessary.

In building, the "lead" is first constructed. This runs at right angles, or very nearly so, to the shore, and consists of a straight line of stakes, to which wire or net webbing is hung from top of high water, or a little higher, to the bottom, making a straight, solid wall.

At a little distance inshore of the outer end of the lead begin what are called the "hearts." These are V-shaped and turned toward the lead, beginning at a distance of 30 to 40 feet on either side of same and running in the same general direction, the "big heart" or outer heart first, the inner heart, supplementing the first, being smaller, and the end of the outer heart leading into it. Some traps have only one heart. The narrow end of the inner heart leads into the "pot" and forms what is known as the "tunnel." The tunnel ends in a long and narrow opening, running up and down the long way, and is held in position by ropes and rods. Below this is what is known as the "apron," a sheet of web stretched from the bottom of the heart upward to the pot, in order to lead the fish into the tunnel when swimming low in the water, and to obviate the necessity of building the pot clear to the bottom, which would be expensive, as the pots of the traps are usually in quite deep water. If the trap is intended to catch the fish coming from only one direction, the lead generally runs to and is attached to one side of the entrance to the outer heart on the side opposite to that from which the fish are expected.

Some traps have "jiggers" (a hook-shaped extension of the outer heart) on each side, and sometimes on only one side, which help to turn the fish in the required direction.

The "pot" is built out beyond the inner heart and immediately adjoining same. It is a square compartment, with web walls and bottom connected in the shape of a large square sack, fastened to piling on all sides. This pot is hauled up and down by means of ropes and tackles, either by hand or, as is most popular, by steam.

The "spiller" is another square compartment adjoining either end of the pot (sometimes there are two spillers, one at each end), and is simply a container for fish. A small tunnel leads the fish from the pot into the spiller, whence the fishermen lift them out. This is accomplished by closing the tunnel from the pot, after which the ropes holding the front of the spiller are loosened and the net wall allowed to drop almost to the level of the water. A steam or gasoline tug then pushes a scow alongside the spiller and takes position on the outside of this scow. From the deck of the tug a derrick is rigged with a running line from the steam capstan through the block at the top of the derrick. This line is attached to the far end of a net apron, called a "brailer," which is heavily weighted by having chains along each side and leaded crossways at several places. A small boat is run inside the spiller, and the men in this draw the brailer across the barge and let it sink in the spiller. The fish soon gather over it, when the steam capstan quickly reels it in, the net folding over as drawn in from its far side and spilling the fish out on the scow. Men on the scow pick out and throw overboard the unsalable and nonedible fish. The apron is then drawn back across the pot and the operation repeated so long as any fish remain. In this manner a trap with many tons of salmon in it is quickly emptied.

Traps, like nearly all other fixed fishing appliances, are built on the knowledge that salmon, like most other fishes, have a tendency to follow a given course in the water, whether a natural shore line or an artificial obstruction resembling one; also that the fish very seldom turns in its own wake. The trap has taken advantage of these natural tendencies of the fish, and is arranged so that, although the salmon may turn, he will continually be led by the wall of net toward and into the trap.

If a trap is located in a place where fish play and where an eddy exists, and the fish run one way with the incoming tide and the opposite with the outgoing, it will fish from both directions; if located where the fish simply pass by, as, for instance, on a point or reef, it will fish from one side only.

A variation of the trap, to be used in places where piles can not be driven, is the floating trap. An experimental trap of this variety was used at Uganuk, on Kodiak Island, Alaska, as early as 1896. Its use was abandoned in 1897, not to be resumed until some years later. A number of floating traps (of the type invented by J. R. Heckman, of Ketchikan, Alaska) have been and are being used in southeast Alaska, the first having been installed in 1907. The design of this trap follows the shape of an ordinary Puget Sound driven trap. It is constructed of logs, 20 to 26 inches at the butt, bolted and braced together in one solid frame. Suspended from this frame through the logs are 2½-inch pipes extending down in the water 30 feet. Halfway down these pipes and also on the extreme lower ends are eyebolts, to which the web is drawn down and fastened. Thus the web is kept in place as well as if the pipes were driven piles. The lead is also a continuation of large piles or logs bolted firmly together with similarly suspended pipes and webbing.

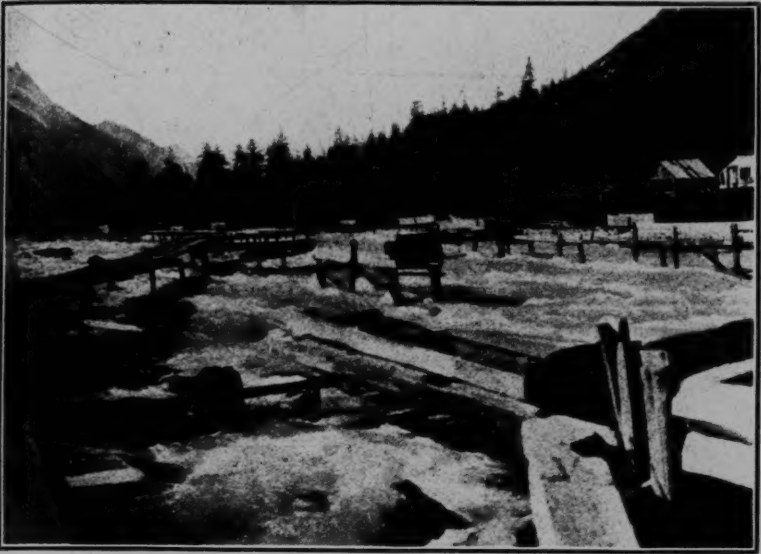


FIG. 1.—RACKS AND RUNWAYS FROM WHICH INDIANS GAFF SALMON, CHILKOOT RIVER, ALASKA.

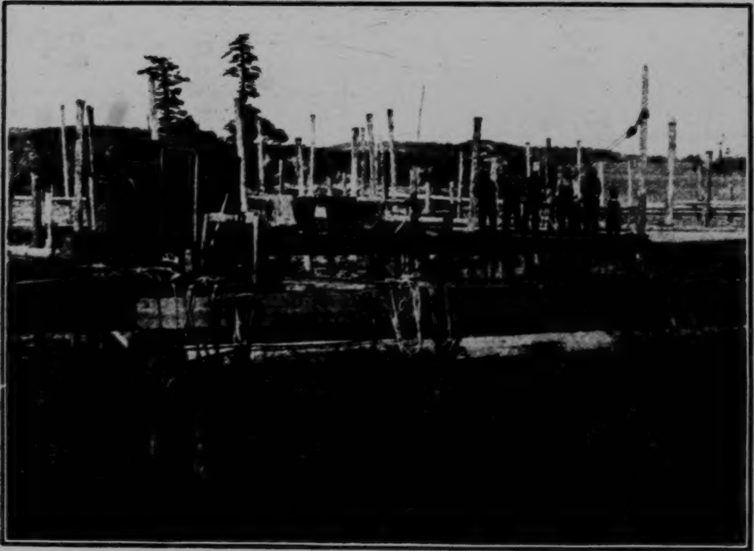


FIG. 2.—THE POT AND SPILLER OF A TRAP NET.

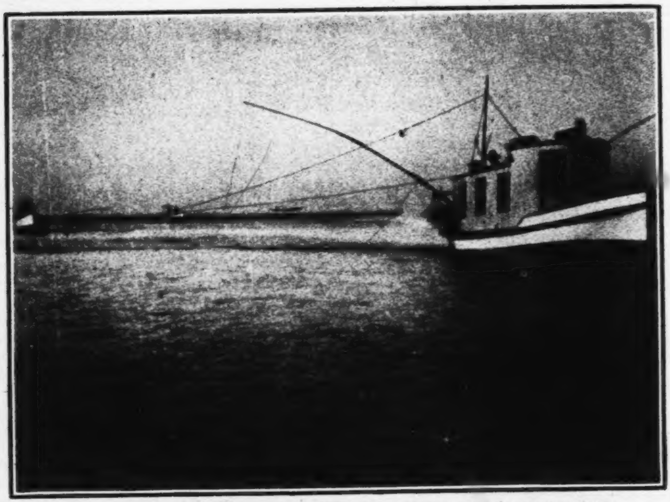


FIG. 1.—TROLLING FOR SALMON ON PUGET SOUND WITH POWER BOAT.

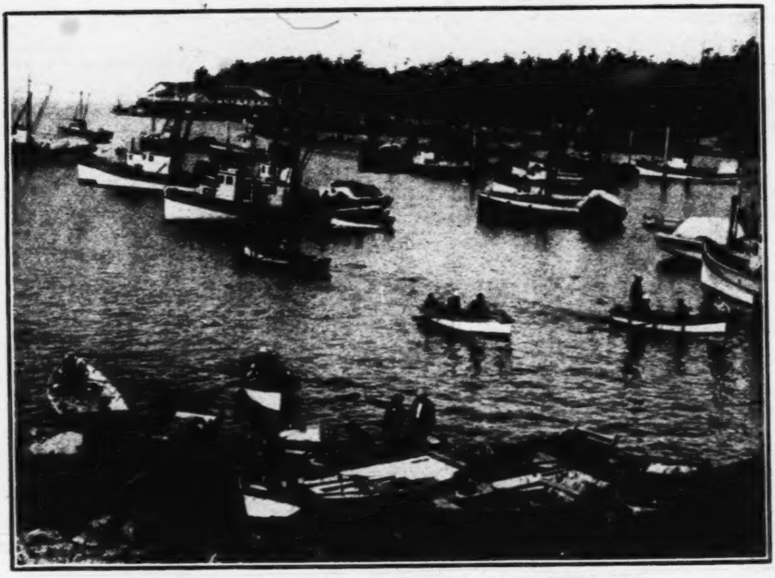


FIG. 2.—PUGET SOUND PURSE SEINE BOATS AT RICHARDSON, WASH.

The so-called wooden traps on the Columbia River are essentially weirs, being a modification of the brush weirs or traps used by the Indians for the capture of salmon long before the advent of the white men. They are built on shore, of piling and planks, the latter arranged like slats with spaces between. The bowl, or pot, is provided with a movable trapdoor that can be opened during the closed season and on Sundays, so that the fish can pass through and run upstream. These weirs, after being built, are launched into the river, placed in proper position near the shore, and then ballasted so that they sink to the bottom.

According to Collins,[a] "pound nets were introduced on the Columbia River in 1879. In May of that year O. P. Graham, formerly of Green Bay, Wis., built a pound net on the river similar to those used on the Great Lakes. The success of this venture led to the employment of more apparatus of this kind, and many fishermen went West to participate in the fishery."

According to the same authority[b] H. B. Kirby, who had previously fished on the Great Lakes, set a pound net in Puget Sound about 1883, but it was a complete failure. On March 15, 1888, he again set a pound net, which he had designed to meet the new conditions, at Birch Bay Head, in the Gulf of Georgia. It proved a complete success, and was the forerunner of the present large number which are set annually in these waters.

In Alaska the first trap was set in Cook Inlet about 1885. British Columbia refused to permit the use of pound nets in its waters until 1904, when their use was allowed within certain limited regions.

Some of these trap nets, especially on Puget Sound, have proved extremely valuable. The years 1898 and 1899 covered practically the high-water mark, as several desirable locations changed hands in those years at prices ranging from $20,000 to $90,000 for single traps, the original expense of which did not exceed $5,000. But few have brought such high prices since, however, owing to the popularity of a cheaper apparatus, the purse seine.

The location of sites for these nets is regulated by law in Oregon, Washington, and British Columbia, but in Alaska the procedure is not well defined and has proved rather confusing to strangers. Some acquire the shore line by mineral location or by the use of scrip, while still others have merely a squatter's right.

Under the existing fish-trap laws applicable to Alaska, a fish trap may be operated anywhere along the coast of Alaska, 300 or more yards from the mouth of any salmon stream, and along the shores of all rivers—excepting those emptying into Cook Inlet, the streams on Afognak Island, and in Wood River—where the same are at least 500 feet wide.

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[a] Report on the fisheries of the Pacific Coast of the United States. By J. W. Collins. Report of Commissioner of Fish and Fisheries for 1888, p. 210. 1892.

[b] Ibid., p. 257.

A clear water distance of 600 yards laterally and 100 yards endwise must be maintained between all traps. At the present time there is no law regulating the length of leads, the maximum depth of water in which the pot may be driven, or the use or occupancy of the trap sites.

It has been decided by the highest courts within the past year (1915) that title to the upland conveys no title to the trap owner who may be in front. The tide lands of Alaska are not of sufficient commercial importance as yet to enter into this controversy. At the present time there is no tide-land law applicable to Alaska affecting the upland owners or the trap-site locators.

At the present time it is probable the canner who is on the ground first and installs a working trap can assert his right to any unoccupied trap site regardless of who fished it the previous season. As a general rule, however, the canners respect the rights of rivals in the same fishing region, and a trap location once recognized as that of a certain individual or company is rarely jumped so long as the original locator cares to maintain a trap on it.

Within the bounds of the forest reserve no land can be acquired except by lease, which may be secured from the United States forestry agent, Ketchikan, Alaska.

INDIAN TRAPS.

The natives, especially in Alaska, have various ingenious methods of catching salmon. In the Bering Sea rivers they catch them by means of wickerwork traps, made somewhat after the general style of a fyke net. These are composed of a series of cylindrical and conical baskets, fitting into each other, with a small opening in the end connecting one with the other and the series terminating in a tube with a removable bottom, through which the captive fish are extracted. Some of the baskets are from 15 to 25 feet in length and are secured with stakes driven into the river bottom, while the leader, composed of square sections of wickerwork, is held in place by stakes.

During the summer of 1910 the author found and destroyed an ingenious native trap set in Tamgas stream, Annette Island, southeast Alaska. This stream is a short and narrow one, draining a lake, about midway of which are a succession of cascades. In the narrowest part of the latter, and in the part up which the fish swim, a rack had been constructed of poles driven into the bottom and covered with wire netting, so as almost wholly to prevent salmon from passing up. Just below, and running parallel to the rack and at right angles to the shore, was placed a box flume with a flaring mouth at the outer end. At the shore end the flume turned sharply at right angles and discharged into a square box with slat bottom

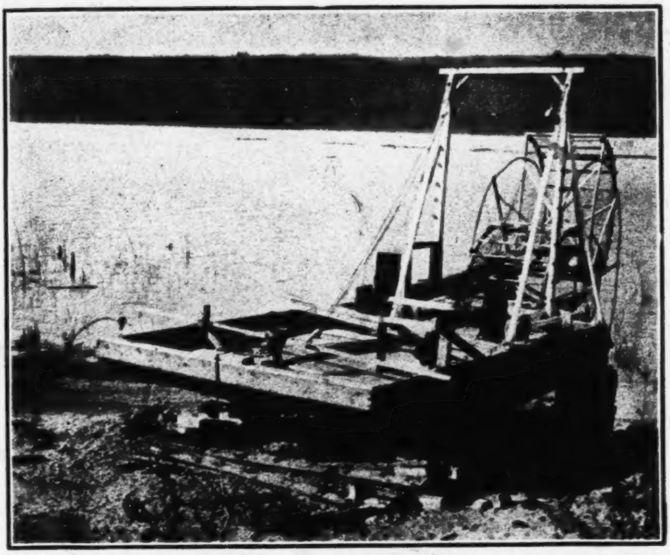


FIG. 1.—A SCOW FISH WHEEL.

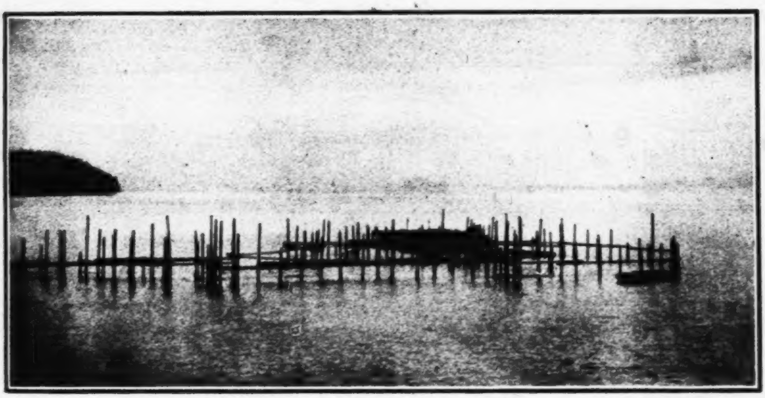
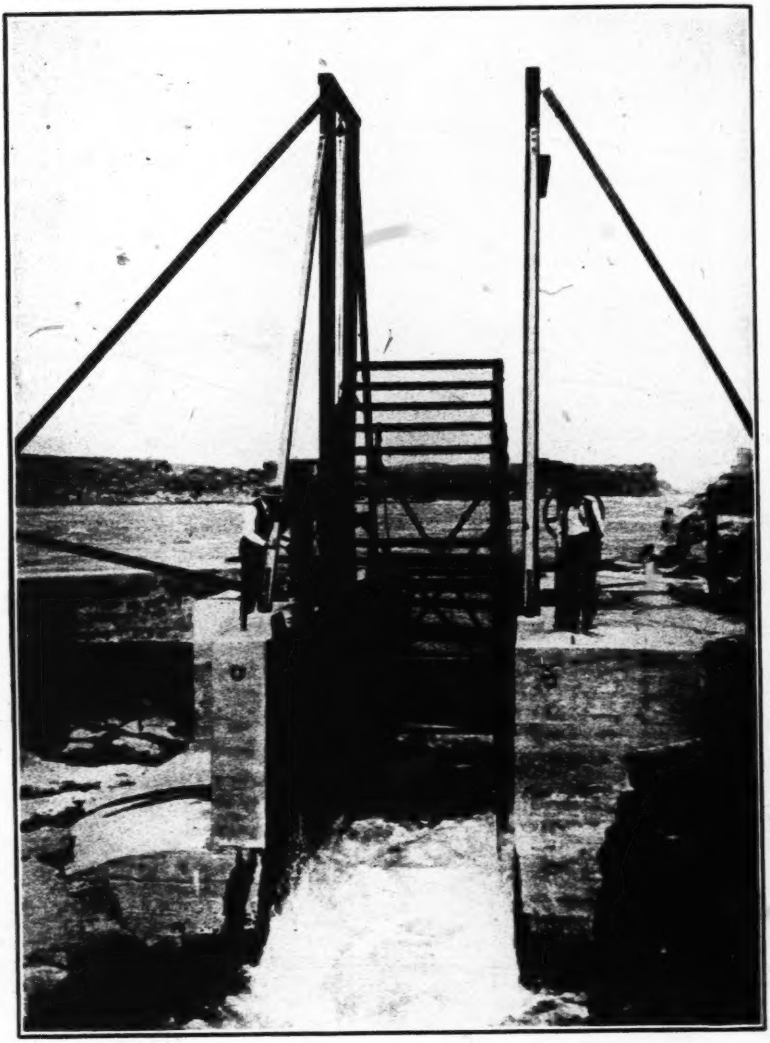


FIG. 2.—PUGET SOUND SALMON TRAP.



A STATIONARY FISH WHEEL.

and covered over with boughs. The fish in ascending the stream would be stopped by the rack and in swimming around many of them would be carried by the current into and down the flume, eventually landing in the receiving box alongside the shore.

WHEELS.

Fish wheels are of two kinds, the floating or scow wheel, which can be moved from point to point if need be, and the shore wheel, which is a fixed apparatus. They operate in exactly the same manner, however. The stationary wheel is located along the shore in a place where experience has shown that the salmon pass. Here an abutment is built of wood and stone, high enough to protect it from an ordinary rise in the river. To this is attached the necessary framework for holding the wheel. The latter is composed of three large scoop-shaped dip nets made of galvanized-iron wire netting with a mesh of 3½ to 4 inches. These nets are the buckets of the wheel and they are so arranged on a horizontal axis that the wheel is kept in constant motion by the current, and thus picks up any fish which come within its sweep. The nets are fixed at such an angle that as they revolve their contents fall into a box chute through which the fish slide into a large bin on the shore. The wheels range in size from 9 to 32 feet in diameter and from 5 to 15 feet in width, and cost from $1,500 to $8,000, the average being about $4,000. A number of them have long leaders of piling running out into the river, which aid in leading the salmon into the range of the wheel.

The scow wheel consists of a large square-ended scow that is usually decked at one end and open at the other. Several stanchions, some 8 to 10 feet high, support a framework upon which an awning is spread to protect the fish from the sun's rays and the crew from the elements. To one end of the scow are fastened two upright posts, which are guyed by wooden supports, while projecting from the same end is the framework which supports the wheel, the latter being constructed in the same way as the stationary wheel, but on a smaller scale. In operation the scow is anchored with the wheel end pointing downstream, and as the wheel is revolved by the current, the fish caught fall from the net into a box chute, through which they slide into the scow. As stationary wheels can be used only at certain stages of water, the scow wheel is a necessary substitute to be used at such times as the former can not be operated, or in places where it is not feasible to build a stationary wheel.

The above forms of wheels are used exclusively on the Columbia River.

An ingenious device is used by some of the wheelmen on the Columbia River in getting their catch to the canneries, a few miles farther down the river. The salmon are tied together in bunches and these attached to air-tight casks and sent down the stream. At the canneries small balconies have been constructed at the water end of the building. A man armed with a pair of field glasses is stationed here, and as soon as he sights one of these casks he notifies a boatman, who goes out and tows in the cask and salmon. About 800 pounds of salmon are attached to a keg, and a tag showing the wheel from which shipped is tied to the fish.

In 1908 the first fish wheel to be located in the coastal waters of Alaska was operated in the Taku River, in southeast Alaska. The wheel was set between two 4-foot scows, stationed parallel to each other, and each 40 feet in length. The wheel had two dips, each 22 feet in width and hung with netting. It could be moved from place to place, the same as the scow wheels on the Columbia River. It was operated throughout the king and red salmon runs, but caught almost no salmon, and was not set in the succeeding years.

For many years the natives of the interior of Alaska have been resorting to the banks of the Yukon River and its tributaries in order to secure a sufficient supply of salmon to sustain them through the succeeding winter. The favorite apparatus of these natives is a type of fish wheel of local invention, which has been in use by them for many years, probably long before the white man first saw the Yukon. A square framework of timbers is constructed in the water and moored to the bank by ropes. A wheel, composed of three dips, is placed in this, the axle resting upon the framework. The shape of the dip is such that the salmon caught roll off it into a trough, down which they slide into a boat moored between the wheel and the shore. Although crude in construction, it is very effective and a large number of them are set each season.

The Columbia River fish wheel is a patented device. It was first used by the patentees, S. W. Williams & Bro., in 1879, and for several years they retained a monopoly in its use. A number are now operating on the river. The device was not new even when patented, as the natives of the Yukon River Basin had been using a precisely similar principle for an unknown number of years previously, while a similar "fishing machine," as it is called, had been in use prior to this time and is still used by white fishermen on the Roanoke River in North Carolina.

REEF NETS.

As the name indicates, this device is used around the reefs. Under natural conditions the reef is covered with kelp throughout its length, the kelp floating at the top of the water. A channel is cut through this, and in it is placed a tunnel of rope and netting, which flares at the outer end, in deep water, and into which is thatched grass, kelp leaves, or any other article resembling submarine growth, to hide the construction sufficiently to avoid frightening the fish. Short leads of kelp are also arranged on the sides so as to draw the fish to the tunnel, which is held in place by anchors. On the reef itself two boats are anchored parallel to each other and some feet apart. An apron of netting is fastened to the rear of the two boats, while the other end extends under the small end of the tunnel and is kept in place by men in the forward ends of the boats, who have lines fastened so the apron can be raised by them. The device can only be used with the tide entering the tunnel at the large end. When the fish have entered and passed through the tunnel upon the apron, the men raise the floating end of the latter and dump them into the boats.

At one time this was a favorite device of the Puget Sound natives for catching sockeye salmon. They attribute its origin to one of the Hudson Bay Co.'s employees, who, they say, taught them a long time ago how to catch salmon in this way. Owing to the large number of men required to work them, and the fact that they can be worked only at certain stages of tide and in favorable weather, these nets gradually have been supplanted by other devices. In 1909 but five were used, and these were operated off the shores of San Juan, Henry, Steuart, and Lummi Islands, and in the vicinity of Point Roberts. Even less are used at present.

TROLLING.

Each year the catching of salmon by trolling becomes of increasing importance commercially. For some years sportsmen had this exciting and delightful occupation to themselves, but eventually the mild curers created such a persistent and profitable demand for king, or chinook, salmon that the fishermen, who had previously restricted their operations to the use of nets during the annual spawning runs, which last but a small portion of the year, began to follow up the fish both before and after the spawning run and soon discovered that they were to be found in certain regions throughout nearly every month in the year.

Trolling has several advantages from the fisherman's point of view over seine, gill net, and trap fishing. To engage in it, one does not require any very expensive gear, a boat, hooks, and lines being all that is required. Then, there are no licenses to pay and no seasons to observe in many sections, as the fishing is done in many instances beyond the jurisdiction of State waters.

The fishermen comprise all nationalities. While the majority of them are professionals, men of all walks of life are to be found engaging in the business, some on account of their health, others because of reverses in business or lack of work, while still others engage in it from pure love of the outdoor life.

The Monterey Bay (Cal.) trollers use 48 cotton line generally. A few inches below the main lead an additional line is added, with a small sinker on it. This gives two lines and hooks, and as the main line has but the one lead, and that above the junction with the branch line, it floats somewhat above the latter, which is weighted down with a sinker. The main stem is about 20 fathoms in length, while the branch lines are about 5 fathoms each. These lines cost about $3.50 each. No spoon is used, but bait almost invariably. A few fishermen use a spread of stout steel wire, 4 feet long, with 5 or 6 feet of line on each end of the spread, two lines and hooks.

On the upper Sacramento River (mainly at Redding and Keswick) some fishing is done with hand lines. A small catch was made here in 1908, but none were so caught in 1909.

Even as early as 1895 trolling was carried on in the Siuslaw River, Oreg., for chinook and silver salmon.

About 1912 the fishermen living along the lower Columbia River discovered that salmon could be taken by trolling off the bar. A number of them went into the business regularly, while their numbers were greatly swelled by the addition of many of the net fishermen during the regular closed seasons on the river, these not applying to trollers. Some idea of the growth of this fishery off the Columbia River Bar may be gained when it is stated that in September, 1915, about 500 boats were engaged in it.

At Oregon City and other places on the Willamette River a number of chinook salmon are caught by means of trolling each year, mainly by sportsmen. A spoon is quite generally employed in place of bait. The fishermen claim that the salmon are not feeding at this time, as their stomachs are shriveled up.

For a number of years the Indians living at the reservation on Neah Bay, Wash., have annually caught large numbers of silver and chinook salmon in the Strait of Juan de Fuca. A large number of white fishermen also engage in this fishery at the present time in the same waters, while others troll for the same species, but more particularly silvers, in parts of Puget Sound proper. The ordinary trolling line, with a spoon instead of bait, is used.

Many of the trollers use power boats, and in this event four and sometimes six lines are used. One and sometimes two short poles are run out from each side of the boat (when two are used on a side, one is shorter than the other), the butt being dropped into a chock. Two lines are generally trailed from the stern. At the end of each pole is a very short line with a small tin can attached. A few pebbles are in the can, and as the launch moves slowly through the water with all her lines set, the troller knows when he has a bite by the rattling of the pebbles in the can. Each of the lines attached to a pole is also connected with the boat by a short line from the side of the latter to a point on the line about 20 feet from where it is attached to the pole. When a fish is hooked, the fisherman merely pulls in the line by means of the short piece and then can haul the fish in hand over hand.

The most remarkable trolling region is in southeast Alaska. For some years the Indians here had been catching king salmon for their own use during the spring months, and about the middle of January, 1905, king salmon were noticed in large numbers in the vicinity of Ketchikan. Observing the Indians catching these, several white fishermen decided to engage in the pursuit, shipping the product fresh to Puget Sound ports. They met with such success that 271,644 pounds, valued at $15,600, were shipped. The next year several of the mild-cure dealers established plants in this region, thus furnishing a convenient and profitable market for the catch, and as a result the fishery has grown until in 1915 2,170,400 pounds of king salmon and 54,400 pounds of coho salmon were caught and marketed. The length of the fishing season has also lengthened until now the business is prosecuted vigorously during about seven months in the year, and in a desultory manner for two or three months more, only the severe winter weather preventing operations the rest of the year.

In southeast Alaska the fishermen generally use either the Hendryx Seattle trout-bait spoon no. 5 or the Hendryx Puget Sound no. 8. The former comes in nickel or brass or nickel and brass, the full nickel preferred. The Siwash hook no. 9/0, known as the Victoria hook in British Columbia, is in quite general use. As a rule, but one hook is used, and this hangs from a ring attached to a swivel just above the spoon, while the point of the hook comes a little below the bottom of the spoon. Occasionally double or treble hooks are used. Some fishermen use bait, and when this is done the herring, the bait almost universally employed, is so hooked through the body as, when placed in the water, to stretch out almost straight and face forward as in life.

There are a large number of power-boat trollers in this region. These trollers generally use one pole on a side and one at the stern. The rowboat trollers use but one line, which is attached to a thwart in the boat, handy to their reach when rowing, and trailing out from the stern of the boat.

The trollers usually have temporary camps where they congregate while the fish are to be found in that section, moving on to some more favorable spot when the fish begin to get scarce.

Reports from the trollers of southeast Alaska prove that all species of salmon will take the hook at some time or other in the salt waters of this region, an examination of their stomachs generally showing that they are either feeding or in a condition to feed.

A small commercial fishery is carried on in this region for coho salmon, mainly in August and September, in the neighborhood of Turnabout Island, in Frederick Sound. A Stewart spoon with two hooks on one ring is used, baited with herring in such a way that the fish is straightened out and faced toward the spoon. The sportsmen of Ketchikan also fish with rod and reel for this species in the neighborhood of Gravina Island, using a Hendryx spoon (kidney bait no. 6), which is silvery in color on one side and red on the other. Although much smaller than the king, the coho salmon is more gamey.

During the latter part of March the Gulf of Georgia, in British Columbia, is invaded by large schools of young coho salmon, locally called "bluebacks." They evidently come in from the sea by way of the Straits of Fuca, as their presence is at first apparent in the lower gulf, especially among the reefs and islands off Gabriola Pass. On their arrival these fish are only about a couple of pounds weight, but increase in size very rapidly, with correspondingly voracious appetites. They are to be found in the gulf throughout the spring and summer. By May the fish generally average close to three pounds each when dressed, while in July they are between four and six pounds in weight.

A number of fishermen with power and row boats engage in this fishery, the fish being either sold to the fresh markets or to the canneries.

Trolling lines and spoon baits of one form or another are used. In fishing from power boats the outer lines are attached to fish poles 15 to 18 feet long, rigged out on either side. Those poles are usually hinged at the foot of a short mast and lowered outboard by a halyard running through a block at the masthead, with the additional brace of a forward guy, which, with the drag of the lines aft, holds them in position. It has been customary to use from five to seven lines from each launch, the two outer lines leading from the ends of the poles; the next pair are attached to intermediate tips fastened halfway out on the main pole; while inboard lines are attached to smaller upright rods on either quarter.

The outer trolls are brought within reach (the poles being practically fixtures) by means of a short piece attached to each fishing line 15 or 20 feet from the point where it is fastened to the pole and leading inboard.

Recently, however, the Dominion authorities have decreed that a troller shall not use more than three lines from a boat when trolling for salmon. Should a man be alone in the boat three lines will keep him very busy if the fish are biting at all well.

Spoons are generally used. All shapes are employed, from the ordinary Siwash patterns to wobblers; brass or silver wobblers, of no. 4 and 5 sizes, are largely used by the fishermen. Spinners of 2 to

3 inches long are also popular. Copper, copper and silver, and brass spinners of the Siwash and Victoria patterns are very effective; while red beads, feathered hooks, or a piece of silvery salmon skin placed on the hook as an additional bait often add to the attraction of a spoon.

Quite generally the fishermen use single hooks on their spoons. Various lengths of line are used, but on the average about 60 feet for outside lines and 40 for inside are used. As fish can be landed much quicker with a short line, the fishermen generally shorten their lines to 20 or 30 feet when the fish are biting rapidly. Quite heavy lines are used from the pole to the sinker; from there extends a length of light line, and then a piece of wire, to which the spoon is attached. The sinker, which is usually between 2 and 3 pounds in weight when fishing from a power boat and about 1 pound when a rowboat is employed, is attached to the line about 18 feet from the spoon.

The best fishing times are in the early morning and evening, without regard to tidal conditions. The low slack water is always favorable to good fishing.

These fish are delicate flavored, but do not keep well, it being necessary to rush them to market if they are to be sold in a first-class condition.

Considerable numbers of these fish are taken by both American and Canadian fishermen on Swiftsure Banks, off Cape Flattery. As complaint had been made in 1914 that these fish were immature and were unfit for canning because of their appearance after being out of the water some hours, H. T. Graves, acting commissioner of agriculture for the State of Washington, which department is concerned with the wholesomeness of food products, made a thorough investigation of their fitness for food. In a letter to the Pacific Fisherman, Seattle, Wash., and published in that journal under date of August, 1914, he states, among other things, the following:

> The question, therefore, for us to determine was to ascertain their value as a food product. The condition of these fish arriving at the various canneries was carefully noted; samples were selected for bacteriological analysis.
>
> The fish when first taken from the water are very soft when compared with the other salmon. After they have been out of the water 12 hours the fish easily separates from the bony structures, and in the course of ordinary handling in the time which elapses between the hour of taking from the water until they are offered for packing at Sound canneries, which is anywhere from 12 to 48 hours, they become badly broken up and present a rather ugly and distasteful appearance, to say the least.
>
> We found that many different methods of handling were being experimented with by the fishermen and by Puget Sound canneries, but without any noticeable effect. While from a physical observation one would imagine these fish as received at the Sound canneries to be unwholesome, a bacteriological examination by Dr. E. P. Fick, State bacteriologist, indicated that putrefaction was not present, although some of the specimens did contain a rather high bacteria count.

BOW AND ARROW.

On the Tanana River, a tributary of the Yukon River, in Alaska, the Indians hunt salmon in birch-bark canoes with bow and arrow. As the canoe is paddled along and the Indian sees the dorsal fin of the salmon cutting the surface of the muddy water he shoots it. The tip of the arrow fits into a socket, and when struck the tip, which when loose is attached to the stock by a long string, comes out of the socket and the arrow floats, easily locating the fish for the fisherman.

SPEAR AND GAFF.

Spears of varying shapes and styles have been in use by the Indians from time immemorial and are still employed on many rivers in which salmon run. With the exception of the Chilkoot and Chilkat Rivers of Alaska, practically all of the catch secured in this manner is consumed by the fishermen and their families. In the Chilkoot River the Indians have built numerous racks in the stream and on the banks, upon which they stand and hook the fish out with a gaff attached to a pole. The catch is sold to the cannery located on Chilkoot Inlet.

SPORT FISHING FOR SALMON.

The number of sportsmen who improve the opportunity presented by the appearance of feeding springs and cohos is increasing yearly, and in time this promises to far excel the sport salmon fishing of the Atlantic coast.

On Puget Sound and lower British Columbia waters the anglers generally use ordinary trout fishing rods and tackle, with preferably a short trolling tip on the rod when out for coho. Small spinners of silver or copper, of about an inch in length, or else the small double Tacoma spoons, are very good. A strong gut leader or trace of fine piano wire is frequently used, as the fish's teeth would cut through an ordinary line. Where iron wire is used the salt water rusts it rapidly, and unless the precaution is taken to dry off the wire and oil it after using it can not be used for more than a couple of days. Sinkers of an ounce or two in weight are generally employed with fine line.

Many of the small spoons on the market have very cheap hooks, and these are apt to straighten out or break with the strain of a large fish. Hooks of the best steel will, however, stand up to this strain.

One of the favorite spots for anglers is at the falls on the Willamette River at Oregon City, Oreg. When the spring run of salmon appears in April, hundreds of anglers, many of them from far distant points, appear to participate in the sport during this month and in May. Many noted sportsmen have fished for salmon at this spot. Among them was Rudyard Kipling, and his experiences were woven into a short story.

The fishing ground is spread over a mile's length of the river, from Clackamas rapids to the deadline at the falls. It is not an uncommon sight to see 500 boats with from one to six fishermen and fisherwomen dotting the river on favorable days during the season.

Two methods of fishing are followed. The most popular is to anchor at the head of the Clackamas rapids or in swift water near the falls and allow the rush of water to spin the trolling hook. In the longer lengths of quieter water the sportsmen troll in slow motor boats or rowboats.

An inexperienced boatman is apt to find fishing in the rapids or near the falls somewhat dangerous, as the swift water may overturn his craft and carry him to his death before help can reach him.

There is a fishway in the dam, so that the fish can pass up this and into the river above the dam. No fishing is allowed closer than 100 feet of the mouth of this ladder. Up to 1915 there was a second deadline, 600 feet from the falls, beyond which no commercial fisherman could operate nets, but the Oregon Legislature in that year closed the Willamette to all net fishermen from the Clackamas rapids to the falls.

The salmon in the spring run on the Willamette will average about 25 pounds each, but examples weighing 50 pounds and over are not uncommon.

In 1914 the Salmon Club of Oregon was formed of anglers who desired to encourage the use of light tackle in the taking of large game fish, in place of the extremely heavy tackle heretofore used The following rules were adopted:

> The rods used may be made of any material except solid bamboo cane. They must not be less than 5 feet in length and weigh not over 6 ounces.
>
> The line must not be heavier than the standard nine-thread linen line.
>
> Any style of reel or spoon may be used and the wire leader must not exceed 3 feet in length.
>
> The angler must reel in his fish, bring it to gaff unaided, and must do the gaffing himself. If a rod is broken at any time during the struggle with the fish it will disqualify the catch.

As a reward of merit the club awards bronze buttons to all anglers taking, on light tackle, salmon weighing 20 pounds or over; for a fish weighing over 30 pounds a silver button is given, and for any salmon over 40 pounds the lucky angler receives a gold button. Numerous additional prizes are also given by public-spirited citizens.

The season for light tackle on the Willamette River and all other inland streams of Oregon has been fixed by the club from January 1 to July 1.

In 1915 the first angler to win a gold button on the Willamette River did so on April 18, when he took a 42½-pound salmon. On the same day this same angler also won a silver button for a 32½-pound fish and a bronze button for a 26-pound fish.

DANGERS TO THE INDUSTRY.

Man is undoubtedly the greatest present menace to the perpetuation of the great salmon fisheries of the Pacific coast. When the enormous number of fishermen engaged and the immense quantity of gear employed are considered, one sometimes wonders how any of the fish, in certain streams at least, escape. High water or low water, either of which will prevent certain forms of apparatus from fishing to any extent while such conditions prevail, storms which impede fishing, and the hundred and one small things which in the aggregate are of considerable importance, however, all aid in assisting the salmon in dodging the apparatus and reaching the spawning beds in safety, while, unless the stream is completely blocked by a tight barricade, an indeterminate number of salmon will escape all the pitfalls man and animals may set for them.

One very essential fact in connection with the annual runs of spawning salmon should not be lost sight of, and that is all salmon die after spawning once, and if more are allowed to reach the spawning beds than are necessary for the perpetuation of the race the excess are an economic waste. An excessive number of spawners on the beds is also harmful, in that the late comers stir up the gravel in which many of the eggs deposited by the early spawners have been sheltered, causing them to float up and become easy prey for the predaceous fishes and birds.

In some sections an almost idolatrous faith in the efficacy of artificial culture of fish for replenishing the ravages of man and animals is manifested, and nothing has done more harm than the prevalence of such an idea.

While it is an exceedingly difficult thing to prove, the consensus of opinion is that artificial culture does considerable good, yet the very fact that this can not be conclusively proven ought to be a warning to all concerned not to put blind faith in it alone.

When salmon are stripped by man, the eggs fertilized and retained in hatcheries until the young are born, and then planted as soon as the yolk sac has been absorbed, it is manifest that the only saving over the natural method is in reducing the loss in the egg stage. We know that many eggs, after being deposited naturally on the spawning beds, are devoured by other fishes, while sudden freshets and occasional droughts also claim their toll of eggs. It is highly probable, although we have no positive data on this point, that these losses far exceed those experienced in artificial salmon culture, and whatever this difference is it represents the extent to which salmon hatcheries should be credited as preservers of the industry, when the fry are planted immediately after the yolk sac has been absorbed. Many hatcheries, however, now hold the young fish until they reach the fingerling or yearling stage before planting them, thus greatly reducing the dangers to which the fish are subject during this stage of their career, and thus adding materially to the value of the method.

In the opinion of the author, the best way in which to conserve the fisheries of the coast is by enacting and enforcing laws under which a certain proportion of the runs will be enabled to reach the spawning beds and perform the final and most important function of their lives unmolested. If this is done, there can be no question of the perpetuation of the industry, and if it is then supplemented by the work of hatcheries, which would reduce the loss in the egg and early fry stages, assurance on this point would be made doubly sure.

If unrestricted fishing is to prevail, however, with a dependence upon hatcheries alone to repair the ravages of man, the industry will suffer seriously, for, from the very nature of things, less and less fish will annually escape through the fishing zone, resulting in a continually lessening quantity of eggs being obtained at the hatcheries, and finally the latter will have to close down from sheer lack of material upon which to work.

Should eggs be brought to the hatchery from other streams, it would merely be "robbing Peter to pay Paul," and in the end the same result would follow in those streams.

Fortunately these matters are becoming increasingly plain to the people of the various States, Provinces, and Territories concerned, and, while a few selfish persons in each are seeking solely their own enrichment by any means possible, the greater number of those interested in fishing operations want to see the industry perpetuated and are willing to do almost anything that will work to this end.

Next to the fishing operations of man, the gravest danger to the salmon fisheries of the Pacific coast lies in the pollution of the rivers which the salmon ascend for spawning purposes. The salmon, both old and young, require pure cold water, and the immense runs which have annually ascended the streams for many years are doubtless due to the fact that such conditions have prevailed in them. The large increase in the population of the coast States within recent years, with the resulting increase of mills and factories, has greatly increased the amount of sewage from cities and towns and the waste from the manufacturing plants. Many of the latter have also constructed dams without adequate fishways, and these also wreak great havoc to the industry by cutting the fish off from the upper reaches of the rivers upon which constructed.

The emptying of sewage into streams ought to be made a crime. It is an exceedingly crude method of dealing with it, and, instead of disposing of the filth, merely transfers it from one place to another, making the water unfit for use at points farther downstream and spreading diseases and death amongst, not only the finny, but also human, users of it.

In the present condition of sanitary science it is a comparatively easy matter to dispose of this filth by modern septic devices, and a number of cities are now disposing of their sewage in this manner.

The irrigation ditch, a comparatively new product on this coast, while of great benefit in developing the arid lands in certain sections, as at present operated is a considerable menace to the salmon fisheries. But few ditches have screens at their head, and as a result many thousands of young salmon slowly making their way to their ocean home pass into and down these to an early doom. Every owner of such a ditch should be compelled to place at its head a screen with fine enough mesh to prevent absolutely the passage through the same of even the tiniest baby salmon.

Next to man and his methods the trout is undoubtedly one of the greatest enemies of the salmon. The Dolly Varden follow the salmon from the sea to the spawning beds, and when the eggs are extruded devour countless thousands of them. Many and many a time the writer has seen on the spawning beds female red salmon swimming around with a cloud of trout spread out behind like a fan, following her every movement, eagerly waiting for the moment when the eggs shall appear.

In the summer, when the young are heading for the sea, the trout are lying in wait for them and again take their toll of countless thousands.

Much is said by certain people of the ravages amongst the salmon of certain animals, as the seal, sea lion, bear, eagle, kingfisher, crane, duck, loon, and hawk. While in the aggregate the ravages of these animals are considerable, they are barely a drop in the bucket as compared with the direct or indirect ravages of man and his agencies.

IV. FISHERMEN, OTHER EMPLOYEES, ETC.

In the early days canning was a haphazard business, and workmen came and went as common laborers do in the wheat fields of the West. As the business increased in importance and the need of skilled labor became imperative, men were put to certain work and kept at it from season to season, with the result that in a few years a corps of highly skilled laborers had been evolved, and this had much to do with the rapid extension of the industry.

For many years Chinese formed the greater part of the cannery employees, the superintendent, foreman, clerks, machinists, and watchmen alone being white. No other laborers have ever been found to do the work as well or with as little trouble as the Chinese. In times of heavy runs, when the cannery would have to operate almost night and day in order to take advantage of what might be the last run for the season of the sometimes erratic salmon, the Chinese were always willing, even eager, to do their utmost to fill the cans, and, if fed with the especial food they insisted upon having and due regard was had to certain racial susceptibilities, the cannery man could almost invariably depend upon the Chinese doing their full duty.

The Chinese-exclusion law cut off the supply of Chinese, and as the years went by and their ranks became decimated by death, disease, and the return of many to China, the contractors were compelled to fill up the rapidly depleting crews with Japanese, Filipinos, Mexicans, Porto Ricans, etc., with the result that to-day in many canneries special quarters have to be provided for certain of the races—more particularly the Chinese and Japanese—in order to prevent racial hatred from engendering brawls and disturbances.

In Alaska the Japanese now compose about one-half of the cannery employees. While a few cannery men express themselves as well pleased with this class of labor, the majority find it troublesome.

In Alaska and at a few places in the States Indians are employed in the canneries. In Alaska more would be employed if they could be secured. They make fair workpeople but are rather unreliable about remaining through the season.

The supplying of this kind of labor is done largely through the contract system. In the large cities along the coast are labor agencies, mainly owned by Chinese, which make a specialty of furnishing labor for this work. In the agreement between the canning company and the contractor the company guarantees to pack a certain number of cases during the coming season and the latter agrees to do all the work from the time the fish are delivered on the wharf until they are ready to ship at the end of the season for a certain fixed sum per case. Should the cannery pack more than the guaranteed number, which it usually does if possible, the excess has to be paid for at the rate per case already agreed upon, while if the pack for any reason should fall below the contract amount, the company must pay for the shortage the same as though they had been packed. The company transports the Chinese to the field of work and carries them to the home port at the end of the season. It provides them with a bunk house and furnishes fuel, water, and salt. The contractor sends along with each crew a "boss," who has charge of the crew, and furnishes their food, the company transporting this free.

White men do the greater part of the fishing for salmon, many nationalities being represented, but Scandinavians and Italians predominate almost everywhere. A number of Greeks are to be found fishing on the Sacramento, while Slavonians do most of the purse seining on Puget Sound. The native-born American is not often found actually engaged in fishing, but frequently is the owner of the gear or has a responsible position in the packing plants.

A number of Indians participate in the fisheries of Alaska, and a few fish in Washington. The only Chinese engaged in fishing are in Monterey Bay. A number of Japanese also fish in this bay, which is the only place in American territory where they fish for salmon. A considerable number of Japanese engage in fishing in Canadian waters.

At many places on the coast, particularly in Alaska, fishing is a hazardous occupation. In Alaska most of it is done in the bays, sounds, and straits, where storms are frequent, and the annual loss of life is heavy. The records of the Alaska Fishermen's Union show for its members the following losses of life by drowning: 1905, 10 men; 1906, 5 men; 1907, 10 men; 1908, 17 men; and 1909, 17 men.

The fishermen early saw the advantages of organization, and nearly every river now has a union, which is subordinate to the general organization. One of the most typical of these is the Alaska Fishermen's Union, which has active jurisdiction over all sections of Alaska, except a portion of southeast Alaska. This organization enters into contracts with the salmon canneries and salteries, by which the rates of wages, duties, etc., of the fishermen are fixed in advance for a period of three years. As a result of this mutual agreement upon terms but little trouble is experienced with the fishermen, who generally conform scrupulously to the terms of the contract, and strikes and bickerings, which were very common a few years ago, are now almost entirely absent.

FISHERIES OF BOUNDARY WATERS.

Waters which form the boundaries between States or between nations, and in which fishing is carried on by the citizens of both, have almost always proved bones of contention, and the Pacific coast has been no exception to the rule.

The Columbia River, which forms the boundary between Oregon and Washington, affords a typical example of the evils which can result from a division of responsibility between two States. For many years each State enacted laws regulating the fisheries of the river with very slight regard usually to laws already in force in the other State. As a result of this the fishermen transferred their residence for license purposes from State to State as the laws of one or the other best suited their particular purposes.

The fishermen and packers also were in apparently irreconcilable conflict as to the proper means to be taken to conserve the fisheries, and each session of the legislatures saw strong lobbies present to work for certain selfish ends, while the few earnest men who had the real welfare of the fisheries of the river at heart had difficulty in making the slightest headway against the influence of these lobbies.

To further complicate the matter, in 1894 Oregon claimed that, under the provisions of the enabling act admitting it as a State, it had jurisdiction to the Washington shore, and proceeded to arrest Washington men who were fishing in what was the open season according to Washington law but the closed season under Oregon law.

In June, 1908, the voters of the State of Oregon had presented for their consideration two bills radically affecting the waters of Columbia River. One closed the river east of the mouth of the Sandy River against all fishing of any kind except with hook and line, and was originated by gill-net fishermen of the lower river for the purpose of eliminating fish wheels in the upper waters. This bill was the first presented to the people, and when it appeared the upriver men retaliated by presenting a bill affecting the lower river to such an extent that it practically prohibited the net fishermen from operating.

Very much to the surprise of all concerned both bills were passed and became laws on July 1, to take effect, as provided, on August 25 and September 10, respectively. The Oregon master fish warden proceeded to enforce both laws, arresting all violators on both sides of the river, irrespective of whether or not they were operating under a Washington or Oregon license, and incidentally did the fisheries a great service by bringing prominently before the public the anomalous condition of affairs which was occasioned by the archaic system under which the fisheries of the Columbia were governed. The State of Washington appealed to the United States courts, which, after argument, issued an injunction preventing the warden from enforcing the laws so far as the Washington fishermen were concerned.

In the meantime the attention of the General Government had been drawn to the apparently irreconcilable conflict between the two States, and fearing that in the mêlée the interests of the fisheries would be lost sight of, President Roosevelt, in a message to Congress, after reciting briefly the lack of harmony in jurisdiction by the States, recommended that the General Government take over the control of the fisheries of the Columbia, as well as other interstate rivers.

This had the effect of bringing matters to a head, and negotiations were soon in progress looking to the preparation of a treaty between the two States by which uniform laws would be adopted, and thus each State have concurrent jurisdiction to the opposite shore of the river. The legislatures each appointed a committee of eight members to confer and frame joint legislation. The two committees met in Seattle, Wash., early in 1909, and agreed upon the following recommendations:

First. A spring closed season from March 1 to May 1.

Second. A fall closed season from August 25 to September 10.

Third. A Sunday closed season from 8 p. m. Saturday of each week to 6 p. m. the Sunday following between the 1st day of May and the 25th day of August.

Fourth. We suggest the mutual recognition by each State of the licenses issued to floating gear by the other State.

Fifth. That the State of Oregon repeal chapter 89 of the session laws of Oregon for the year 1907, relative to the operation of purse seines and other like gear on the Columbia River.

Sixth. We recommend the enactment of similar laws in both States carrying an appropriation of at least $2,500 in each State and providing for the destruction of seals and sea lions and the granting of a bounty on the same, to be $2.50 for seals and $5 for sea lions.

Seventh. We recommend the repeal of both the fish bills passed under the provisions of the initiative and referendum in June, 1907, by the people of the State of Oregon, said bills being designated on the ballot as 318, 319 and 332, 333.

The recommendations were enacted into law by both States, and at the same time the State of Washington in its bill also prohibited fishing for salmon within 3 miles of the mouth of the Columbia between March 1 and May 1 and between August 25 and September 10, or salmon fishing on tributaries of the Columbia, except the Snake, between June 1 and September 15; and also prohibited fishing for salmon by any means save by hook and line in the Kalama, Lewis, Wind, Little White Salmon, Wenatchee, Methow, and Spokane Rivers and in the Columbia River 1 mile below the mouth of any of the rivers named. The agreement was subjected to a rather severe strain, however, when it was discovered that the Oregon Legislature had failed to provide the same closed periods for the tributaries that were enacted for the Columbia, thus leaving the Willamette, Clackamas, Lewis and Clark, and Youngs Rivers and Spikanon Creek open to fishing for 15 days in March and 15 days in April, while the

Columbia was closed. The cry of bad faith was at once raised by the Washington fishermen, and for a short time it appeared that the agreement would be broken at the very beginning. The Oregon Board of Fish Commissioners took the matter up, however, and by order closed these streams to all fishing during the times of closed season on the Columbia, and thus restored peace once more.

This agreement continued in force until 1915, when the legislature of each State prepared for a thorough revision of its fishery code. In order to make this revision more effective, committees from both legislatures were appointed and held joint meetings in Portland, where they mutually agreed upon laws covering the fisheries of the Columbia River, and in order to make this agreement more binding the following chapter was inserted in the codes finally adopted:

> All laws and regulations now existing, or which may be necessary for regulating, protecting, or preserving fish in the waters of the Columbia River, over which the States of Oregon and Washington have concurrent jurisdiction, or any other waters within either of said States, which would affect said concurrent jurisdiction, shall be made, changed, altered, and amended in whole or in part only with the mutual consent and approbation of both States.

As such an agreement between two States requires the approval of Congress, a bill ratifying same was introduced in Congress on December 16, 1915. This compact was not acted on by the 64th Congress.

The conditions which prevail in Puget Sound adjacent to the boundary between Washington and British Columbia have also been the cause of serious anxiety to those interested in the perpetuation of the salmon fisheries. The great schools of sockeye salmon which are on their way from the ocean to the spawning beds in the Fraser River pass through this section, and it is here that the greater part of the fishing is done. The Province of British Columbia and the State of Washington are vitally interested in the preservation of these fish, but, unfortunately, they seem to be unable to agree upon any definite policy with regard to their conservation, although it would appear to the unprejudiced observer that it ought to be possible to find some common ground upon which they could agree.

This condition of affairs on Puget Sound and similar conditions in other boundary waters led the General Government to take up the matter, and on April 11, 1908, a convention was concluded between this country and Great Britain for the protection and preservation of the food fishes in international boundary waters of the United States and Canada. Both Governments appointed international commissioners—Dr. David Starr Jordan for the United States and S. T. Bastedo (who was succeeded later by Prof. Edward Ernest Prince) for Canada—whose duty it was to investigate conditions prevailing in these waters and to recommend a system of uniform and common international regulations. After an exhaustive investigation the commissioners submitted recommendations, which included the following affecting the boundary waters dividing the State of Washington and the Province of British Columbia, these waters being defined as the Strait of Juan de Fuca, and those parts of Washington Sound, the Gulf of Georgia, and Puget Sound lying between the parallels of 48° 10′ and 49° 20′:

GENERAL REGULATIONS.

3. Disposition of prohibited catch.—In case any fish is unintentionally captured contrary to the prohibitions or restrictions contained in any of the following regulations, such fish shall, if possible, be immediately returned alive and uninjured to the water.

4. Dynamite, poisonous substances, etc.—No person shall place or use quicklime, dynamite, explosive, or poisonous substances, or electric device in treaty waters for the purpose of capturing or killing fish.

5. Pollution of waters.—No person shall place or pass, or allow to pass, into treaty waters any substance offensive to fishes, injurious to fish life, or destructive to fish fry or to the food of fish fry, unless permitted so to do under any law passed by the legislative authority having jurisdiction.

No person shall deposit dead fish, fish offal, or gurry in treaty waters, or on ice formed thereon, except in gurry grounds established by the duly constituted authorities.

6. Capture of fishes for propagation or for scientific purposes.—Nothing contained in these regulations shall prohibit or interfere with the taking of any fishes at any time for propagation or hatchery purposes, and obtaining at any time or by any method specimens of fishes for scientific purposes under authority granted for Canadian treaty waters by the duly constituted authorities in Canada and for United States treaty waters by the duly constituted authorities in the United States.

12. Capture of immature salmon prohibited.—No salmon or steelhead of less than 3 pounds in weight shall be fished for, killed, or captured in treaty waters.

13. Salmon weirs, etc., above tidal limits prohibited.—No salmon and no steelhead shall be fished for, killed, or captured by means of a net of any sort, any weir or any fish wheel, above tidal limits in any river in treaty waters.

14. Close season for sturgeon.—During the term of four years next following the date of the promulgation of these regulations no sturgeon shall be fished for, killed, or captured in treaty waters.

15. Capture of fish for fertilizer or oil prohibited.—Fishes useful for human food shall not be fished for, killed, or captured in treaty waters for use in the manufacture of fertilizer, or of oil other than oil for food or medicinal purposes.

16. Naked hooks and spears prohibited.—No spear, grappling hook, or naked hook, and no artificial bait with more than three hooks, or more than one burr of three hooks attached thereto, shall be used for the capture of fish in treaty waters. This regulation shall not prohibit the use of a gaff in hook-and-line fishing.

17. Torching prohibited.—No torch, flambeau, or other artificial light shall be used as a lure for fish in treaty waters.

The following regulations relate specifically to the waters named:

STRAIT OF JUAN DE FUCA AND ADJACENT WATERS.

The following regulations (62 to 66, inclusive) shall apply to the Strait of Juan de Fuca, those parts of Washington Sound, the Gulf of Georgia, and Puget Sound lying between the parallels of 48° 10′ and 49° 20′ north latitude:

62. *Close season for salmon.*—From August 25 to September 15 in each year, both days inclusive, no salmon or steelhead shall be fished for, killed, or captured for commercial purposes in these treaty waters; provided, however, that in the waters to the westward of a line drawn southward from Gonzales Point to the shore of the State of Washington silver salmon, or coho salmon, may be fished for, killed, or captured from September 1 to September 15 in each year, both days inclusive.

63. *Weekly close season for salmon and steelhead.*—From 6 o'clock Saturday morning to 6 o'clock on the Monday morning next succeeding, no salmon or steelhead shall be fished for, killed, or captured in these treaty waters.

It is, however, provided that in the waters to the westward of a line drawn southward from Gonzales Point to the shore of the State of Washington the weekly close season shall begin 12 hours earlier, and shall end 12 hours earlier.

64. *Construction of pound nets.*—All pound nets or other stationary appliances for the capture of salmon or steelhead shall be so constructed that no fish whatever shall be taken during the weekly close season. The erection or addition to the pound net of a jigger is prohibited.

65. *Location of pound nets.*—All pound nets shall be limited to a length of 2,500 feet, with an end passageway of at least 600 feet between one pound net and the next in a linear series, such distance being measured in continuation of the line of direction of the leader of such net, and a lateral passageway of at least 2,400 feet between one pound net and the next.

On and after January 1, 1911, the mesh in pound nets shall be 4 inches in extension in the leader and not less than 3 inches in other parts of the net.

66. *Nets other than pound nets.*—No purse net shall be used within 3 miles of the mouth of any river and no seine within 1 mile of the mouth of any river in these treaty waters.

No gill net of more than 900 feet in length or of a greater depth than 60 meshes shall be used in these treaty waters.

The effort to enact these regulations into law by our Congress met with decided objections not only on the part of the Puget Sound operators, but also from operators in other waters affected, with the result that the bill is now virtually dead.

V. THE SALMON FISHERIES OF SIBERIA.

As on the Alaska coast, the aborigines of Siberia must have learned early of the excellent food qualities of the salmon which each year frequented the rivers of that country for spawning purposes, and not only ate them fresh but also dried large quantities for winter use of themselves and their dogs.

Owing to the inaccessibility of the Siberian coast, due mainly to the lack of transportation facilities for many years, and the decided objection of the Russian Government to travelers roaming over the country, partly because of the presence of political and criminal convicts, and partly because of a fear that they might learn too much of its resources, there has been but little written, especially with regard to its fishery resources, about this remote section of the Russian Empire, and what little has been published is usually filled with inaccuracies, due, doubtless, in many instances, to the fact that the writer generally had to get most of his information at second and third hand and was also unfamiliar with fishery subjects.

Most of the data given below were obtained directly from persons living in Siberia or Japan, most of whom are engaged in the fishing industry of Siberia, or from Americans who have on various occasions visited the country in order to view its fishing possibilities at first hand.

SPECIES OF SALMON.

All five species of salmon are to be found along the Siberian coast. Although we have very little authentic data relating to their movements, these are doubtless similar to the runs on the Alaska coast, where climatic and other conditions are very similar. Nearly all streams from the Arctic Ocean to north China seem to have runs of one or more species. The steelhead does not appear to be an inhabitant of the Asian coast.

The fishing carried on by the Russians has usually been along the rivers of the mainland, principally in the Amur and on Sakhalin Island.

From very early times Japanese fishermen have frequented the Siberian coast and Sakhalin Island, the southern portion of the latter being owned by Japan, being drawn here mainly by the rich stores of salmon which could be secured easily and quickly and were so necessary to eke out the vast quantity needed to supply such a fish-eating nation as Japan.

The exhaustion of the fishery resources of many of the European waters belonging to Russia has forced some of her more enterprising fishermen to seek for new supplies in her Siberian waters, and as these resources become better known, and means of transportation are increased and improved, there will doubtless be a tremendous impetus given to their development.

FISHING DISTRICTS OF SIBERIA.

The Amur fishing district is subdivided into four districts, as follows: Nikolaievsk, Chnirahsky, Pronga, and Sakhalin. The first named consists of 22 fishing stations belonging to the municipality of Nikolaievsk and 35 to the Department of Domains. The shore line is about 230 miles. Next in importance is the Chnirahsky district, and this includes some very important and valuable fishing plants. In the Pronga district are also several good fishing plants. The Sakhalin Island district includes all the fisheries of Russian Sakhalin Island north of 50° north latitude.

The fisheries of the Usuri River, a tributary of the Amur, are controlled almost entirely by the local peasants, cossacks, and natives, who, owing to the inadequate means of transportation, are able to market but a small part of their catch otherwise than amongst themselves. The same is true also of Lake Hinka.

The Kamchatka region has had the most important development of recent years, and now comprises within its boundaries most of the salmon canneries of Siberia. There are about 187 fishing stations in this district, the vast majority of which are held by Japanese.

The Anadir district is said to be richer in fish than the southern districts of eastern Siberia. The chief commercial fisheries are concentrated near the Anadir River. A considerable quantity of salmon is frozen in this district for export.

FISHERY RIGHTS AND REGULATIONS.

Along the entire seacoast of Siberia, by virtue of the Russo-Japanese convention of 1907, concluded for 12 years, the Japanese are permitted to engage in fishing on equal terms with Russians. In such sections there is no restriction with regard to the nationality of the laborers employed or the method of preparing the fish, except that the manufacture of fish manure from fish of the salmon variety is prohibited. On the face of it this convention looks like an equitable agreement, but in putting the Japanese on the same footing as the Russians it subjected them to a lot of unstated and arbitrary laws, by-laws, and local regulations, besides making the tenure exceedingly short, virtually only one year, as a result of which Japanese capital refuses to erect more than the crudest of plants.

Fishing rights in the gulfs and bays not included in the Russo-Japanese convention, such as Peter the Great Bay, Imperial Harbor, Vanina Bay, Avatchinsk Bay, and others, as well as the rivers of Okhotsk and Kamchatka, are granted by the Governor General, without public tenders, to persons of good repute, but for one year only, and if they show their ability to establish a successful fishing station a lease for 12 years can be secured on the basis of paying a royalty of 2½ cents per pood (36.112 pounds) of prepared fish. Under the terms of the lease only Russian subjects can be employed at the stations, while all sailing vessels serving the stations must be under the Russian flag.

The regulations governing the river districts vary from those relating to coast concessions, and also vary from each other, as the local authorities in the river districts are authorized to issue temporary rules and regulations to cover local conditions.

On the Amur River, within the boundaries of the Nikolaievsk, Mariinsk, and Khabarovsk districts, the fishing stations are leased by public auction to the highest bidder, some on a long-term basis and others for only one year. At stations above the city of Nikolaievsk, within 30 miles of the Amur estuary and farther, no foreign labor is allowed. Below the city of Nikolaievsk foreign labor can be employed to handle the fish on shore, but the actual fishing can be done only by Russian subjects.

At the present time the chief aim of the Russian authorities is to break the monopoly the Japanese have of the fisheries along the greater part of the coast. This will be an exceedingly difficult thing to do, owing to the proximity of the Japanese to the Siberian coast, the ease with which they can transport by water the necessary supplies, etc., for carrying on the fisheries, the vastly greater skill in carrying on this work displayed by them over their Russian competitors, and their unlimited supply of cheap labor, while the Russian fisheries are badly hampered as a result of the few Russian subjects available for such work and the consequent high wage cost of same. Japan also has another big advantage in that she is at present almost the sole market for the greater part of the salmon and other fishes taken in Siberia. The very fact of this fish being necessary for feeding her people will cause Japan to battle hard to hold her present advantage.

The development of the salmon and other fisheries of Siberia has been much hampered by the disinclination of the Russian Government to permit foreigners to acquire fishing concessions except on very short tenure. As the Russians themselves are generally unskilled in fishing operations, and are compelled to do the work with Russian labor, which is quite scarce, they do but little with their concessions. American capital would doubtless be available for developing Siberia's fisheries were it assured of a sufficiently long tenure of lease with some other minor concessions.

APPARATUS EMPLOYED.

In the river districts somewhat primitive fishing apparatus is employed. Spears, dip nets, and the other simple forms which seem to be common to all savage tribes depending upon the water for the greater part of their subsistence, are all in use by the natives living along the upper reaches.

Weirs of a primitive type are also used. These have a lead consisting of willow poles and branches built from the river bank or a sand bank out into the stream. At the outer end is attached a net compartment with a lead, into which the fish, which have been following the lead in the search for an opening, pass. Two men in a boat are anchored close by, and as soon as 30 or 40 salmon have passed into the compartment, it is hauled up and the fish emptied into the boat after which the net is reset.

Haul seines of varying lengths and depths are used in connection with the more important river fishing stations.

Along the coast the Japanese use a floating trap net somewhat similar to the type used in Alaska, also haul seines and a few gill nets.

ABUNDANCE OF SALMON.

It is exceedingly difficult to secure even approximate statistics of the Siberian catch of salmon, owing to the wide extent of coast, the totally inadequate means of transportation preventing close supervision, the presence of so many foreigners who go directly home with their catches at the end of the season, and the crude system of control in operation by the authorities.

The following table shows the catch of salmon in the four districts for the year 1898:

Districts.	Spring.	Summer.	Autumn.
Nikolaievsk	....	7,464,896	4,685,480
Chnirahsky	60,000	873,000	2,602,000
Pronge	1,067,000	316,950	665,500
Sakhalin	606,000	635,000	748,000
Total	1,733,000	9,289,846	8,700,980

In the Anadir district the catch in 1909 was as follows: Cape St. Michael, 91,616; above Cape Neuman, 8,234; Anadir River, 150,746; Anadir River estuary, 9,864; Hanchelar River, 6,121; Cape Observation, 270,000; total, 536,581. The catch by natives and small Russian fishermen is estimated at about 3,000,000 and 500,000 fish, respectively. In addition to this, 130 barrels of caviar, weighing 14 tons, were prepared, and there were 20 tons from Cape Observation.

According to the statistics of the Fisheries Control, the catch of salmon in the Amur River in 1910 was as follows: Spring salmon, 7,701,344; summer salmon, 21,384,549; autumn salmon, 9,546,254; in all, 38,632,147. Of this number 34,649,025 fish were marketed and the balance consumed locally. Japan bought 23,228,481 fish, valued at $473,800; the balance was valued at $681,345. In addition there were 4,766,784 pounds of salmon caviar, valued at an average price of $0.114 per pound, totaling $543,413, which brings the total value of the salmon catch and by-products up to $1,698,558. During the same year, in Peter the Great Bay, 8,263 salmon were caught.

The number of salmon caught in eastern and western Kamchatka and in the bays and rivers in this region not included in the Fishing Convention, and at the Russian river stations, in 1911, was as follows:

Species.	Western Kamchatka.	Eastern Kamchatka.	River stations.	Bays and river outlets.	Total.
Chavitch (king)	5,421	7,818	207	590	14,036
Keta (chum)	3,082,300	2,675,000	297,300	890,790	6,945,390
Krasnaia (red)	2,136,800	747,000	680,000	236,240	3,800,040
Garbusha (humpback)	39,448,500	1,411,000	1,320,200	175,980	42,355,680
Kishutch (coho)	227,200	179,000	114,200	7,770	628,170
Total	45,000,221	5,019,818	2,420,907	1,311,370	53,752,316

In the Okhotsk district the catch amounted to 827,274 keta and 37,790 krasnaia. Of salmon caviar 489 tons were prepared by the Japanese and 60 tons by the Russians.

In 1915 about 50,000 barrels of pickled salmon were prepared on the Amur River. In the sections covered by the Fishing Convention 6,000,000 salmon, mostly keta with a few krasnaia, were dry-salted, while 80,000,000 humpback salmon, called "salmon trout" in Japan, were so prepared. No fish were frozen for the European market, due to the war. A considerable quantity of caviar was prepared, but the quantity is unknown. The pack of canned salmon is shown elsewhere.

FREEZING SALMON.

As when the Russians owned Alaska, the exploitation of Siberia was carried on for many years by trading companies with large powers granted by the Government. In 1892 a very enterprising company was in charge, judging from the following extract from a letter written on February 2, 1893, by the late Eugene G. Blackford, the well-known fish dealer of New York, to the late Col. Marshall McDonald, then United States Commissioner of Fish and Fisheries:

> I have just learned of the arrival in Chicago of 60,000 pounds of frozen salmon. They were caught in Petropavlovsk, Kamchatka. These fish are a new venture

undertaken by a commercial trading company who control that country, and these salmon have been taken from a river where none have been caught before, and my information is that they catch fish weighing as much as 150 pounds each. The above lot of fish was brought frozen to Tacoma and then shipped by refrigerator car to Chicago where they were sold to Mr. Booth of the Booth Packing Co., Chicago. Mr. Booth has declined to pay for them because of their not being in satisfactory condition.

Nothing further appears to have been done in this line until in 1903, when a Berlin fish merchant outfitted and sent to the Siberian coast a refrigerator steamer with a capacity of 2,500 tons. The fish were caught mainly in the Amur River and were frozen immediately after being brought aboard. In all, 160,000 salmon were obtained, and these were in excellent condition when landed at Hamburg, Germany.

In 1907 the Salmon Steam Fishing Co., a combined British and Japanese company, chartered the steamers *Zenobia* and *Zephyrus*. These vessels were fitted with refrigerating apparatus and cold-storage chambers and sent to the Kamchatkan Peninsula to get a cargo. Both secured good cargoes.

In 1909 two refrigerating steamers visited the coast and froze salmon for the European market. One vessel was outfitted by a British company and the other by a German company, J. Lindenberger (Inc.). The latter reported that the chum salmon, the principal species frozen, were large and very bright. The British steamer left England in April and arrived home again late in December.

CANNING SALMON.

In 1900 the Kamchatka Commercial & Industrial Co. (Ltd.), was organized at St. Petersburg, Russia, by A. T. Prozoraf, president of the St. Petersburg Chamber of Commerce, P. M. Grunwalt, H. T. M. Court, and A. A. Prozoraf, secretary. A complete canning outfit was purchased in the United States, and the first cannery in Siberia established at Petropavlovsk, Avacha Bay, Kamchatka.

The San Francisco Trade Journal, under date of December 19, 1902, printed the following item relating to the operations of this cannery:

> On December 8 the Russian barkentine *Bitte* arrived from Petropavlovsk. Siberia, with 10,436 cases canned salmon. This is the first consignment of salmon received from them.

The greater part of the pack comprised dog salmon, although they were labeled "pink" salmon, the rest being reds and kings.

In 1903 the company did not operate, the fishing season being devoted to moving the plant to Ust-Kamchatka, at the mouth of the Kamchatka River, where, after being in use altogether for two or three years, it was abandoned and left all standing.

In 1907 two canneries were established in the estuary of the Amur River, near Nikolaievsk, but beyond getting out samples they were never operated.

In 1910 A. G. Denbigh, an Englishman, built a modern cannery near the second site of the Kamchatkan Commercial & Industrial Co. That year the cannery produced only about 10,000 cases, but each year since the equipment of the plant has been enlarged and improved until in 1913 the pack amounted to 60,000 cases. Early in 1914 a complete one-line plant of American can-packing machinery was installed.

In 1912 Mr. Denbigh built another cannery 1½ miles away from the above plant. This plant was first operated with German and Norwegian sanitary machinery, but in 1914 a two-line American sanitary can-packing plant was installed, the can-making plant at the first plant making all the cans needed at the two canneries.

In 1915 a number of additions were made to both plants in the line of flat fillers, etc., while still more were in contemplation for 1916.

Mr. Denbigh also operates a hand cannery at Compocowa, on the west side of the Kamchatka Peninsula.

Up to 1912 very few canneries, and these very primitive affairs, had been built by the Japanese, owing to the uncertainty of tenure referred to previously. The "canneries" were mere sheds or shelters where the cans—which were brought from Japan, made or half made—were filled, closed, and cooked, furnace-heated, vertical retorts being used for the latter purpose. If the owner lost his concession at the end of the fishing season he simply took his retorts away with him and the buildings were left to his successor.

In 1912 a Tokyo company (Ichigumi & Co.) put up two canneries near the Ozernaya River in Kamchatka, while a Japanese from Niigata, Japan, also put up a small plant in the same vicinity. Both plants were cheaply built and operated with hand-power machinery and small vertical retorts. That year the two companies together packed about 13,500 cases of salmon.

The same season Ichigumi & Co. put up another hand-power cannery, and Tsutsumi & Co., of Hakodate, Japan, built two others of the same type near the Kamchatka River, on the east coast.

In 1913 Tsutsumi & Co. built a modern cannery at Ozernaya and installed a complete line of American sanitary can-making and can-packing machinery.

The same year Ichigumi & Co. put up two hand-power canneries near the Kamchatka River, having succeeded to the concessions formerly held here by Tsutsumi & Co. In 1914 they built a modern plant and installed a complete line of American sanitary can-making and can-packing machinery.

The St. Petersburg firm of S. Grooshetsky & Co., which has been engaged for a number of years in the freezing of salmon and in the preparation of salmon caviar, under the name of the Pacific Ocean Sea Industry Association, erected a cannery near Ozernaya in 1914, and installed in it a full line of American sanitary can-making and can-packing machinery. This plant will compare favorably with most of our Alaska canneries. The buildings are of iron.

In 1915 a number of extensive improvements in the way of new buildings, machinery, etc., were made to the various plants, and during the winter of 1915–16 several of the canning firms had representatives in this country selecting much additional machinery for use during the 1916 season.

The following table[a] shows the detailed pack of canned salmon made by the various companies operating in Siberia in 1915:

Name and cannery location.	Canneries.	One-pound flats.					Total.
		Reds.	Springs.	Silyers.	Chums.[a]	Humpbacks.	
		Cases.	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
A. G. Denbigh, Kamchatka River (2) and Compocowa	3	58,000	....	26,000	38,000	....	122,000
S. Grosshetsky & Co., Bolsheretsk	1	6,000	....	....	23,000	....	29,000
Minard & Co.	1	....	....	....	7,000	....	7,000
Nichiro Fishing Co. (Ltd.), Kamchatka River	1	14,703	3,334	2,191	11,981	....	32,209
Sugamiya	1	2,200	....	....	....	....	2,200
Tsutsumi & Co., Ozernaya	1	[b] 37,800	....	....	8,800	....	46,600
Hand-pack canneries, East and West Kamchatka	2	1,000	....	....	4,000	10,000	15,000
Total	10	119,703	3,334	28,191	92,781	10,000	254,009

[a] Called "Pinks" in Siberia.

[b] Includes 10,80- cases one-half pound flats of 8 dozen each.

The following table[b] shows the pack of canned salmon in Siberia from 1910, the virtual inception of the industry, to 1915, inclusive:

Years.	Springs.	Reds.	Silvers.	"Pinks."[a]	Humpbacks.	Total.
	Cases.	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
1910	....	5,500	2,500	2,000	....	10,000
1911	....	15,000	6,000	4,000	....	25,000
1912	....	43,500	18,000	16,000	....	77,500
1913	....	102,900	7,000	21,000	2,500	133,400
1914	....	85,000	22,500	27,000	2,000	136,500
1915	3,334	119,703	28,191	92,781	10,000	254,009
Total	3,334	371,603	84,191	162,781	14,500	636,409

[a] Chum salmon are marketed under a "Pink" label.

SALTING SALMON.

By far the greater part of the salmon catch of Siberia is either pickled or dry-salted. This was the earliest commercial method initiated on the coast and has been followed for a number of years, mainly by the Japanese. The coast is dotted with concessions worked by Japanese, while there are large numbers in operation along the rivers, these being restricted to Russians. An idea of the extent of this branch of the industry may be gathered when it is stated that in 1915 there were 50,000 barrels of pickled salmon prepared in the Amur region, while the Japanese dry-salted about 6,000,000 dog salmon, including also a few reds, and 80,000,000 humpbacks, or "salmon trout," as they are called in Japan.

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[a] From Pacific Fisherman Year Book for 1916, p. 44.

[b] Idem., p. 39.

In pickling salmon the fish are split down the back, the sides being held together by the belly. The roe, gills, and viscera are removed and the fish are then washed, and after salting are placed in large tanks for seven or more days, or until they are thoroughly struck, after which they are packed in barrels, flesh side up, except the two top layers, which have the skin side up. To about 700 pounds of fish 180 pounds of salt are used.

The dry-salting, next to drying, is the most primitive method employed in preserving salmon. The process consists simply in splitting the fish up the belly, removing the gills and entrails, and then filling the belly with salt. The fish are then placed in rows on matting and covered with salt, and other rows are placed on top of them until the pile is from 8 to 10 feet high, when the entire lot is covered with matting and left for about seven days, after which they are relaid and again covered with salt. For shipping the fish are packed in mats.

A very odd feature in connection with the operation of most of the Japanese plants is that the salt to be used in curing the fish is usually dumped loose onto some level spot, with absolutely no covering over it, and exposed to the elements.

The Japanese consume enormous quantities of these dry-salted salmon. During the Russian-Japanese war the latter country's fishermen were cut off from access to their usual fishing grounds, with the result that they were forced to look elsewhere for fish. During 1905 and 1906 large quantities were prepared in Alaska, British Columbia, and Washington for this trade, but as soon as the war ended and the Japanese got access once more to their old fishing grounds, the Japanese duty on salt fish, which had been suspended during and for a short period after the war, was reimposed. As a result our fishermen soon quit the business, and since then operations on this coast have been almost wholly restricted to Japanese operating in British Columbia waters.

At the height of the production on this coast Mr. King, the American consular agent at Hakodate, Japan, made the following suggestions to preparers and shippers of dry-salted salmon for the Japanese trade:

> The salmon should arrive in Japan by December 1. Most of these fish are used among the Japanese for New Year's presents. After the new year the price invariably declines 20 to 30 per cent, and for a month or two the fish are difficult to dispose of, as the consumers always stock up before the new year.

The salmon should weigh not less than 5 pounds when thoroughly cured. They should be free from spots, which are usually found on the salmon if caught in fresh or brackish water. No Japanese would think of giving a salmon with red and black spots to a friend for a New Year's present, and spotted fish never realise more than half the price obtainable for clean white fish. The salmon should be split up the belly and should be salted with fine salt. Coarse salt always tears the flesh of the fish when being rubbed in. Care should be taken that the salmon are not oversalted.

Semga salting is a more improved and sanitary method than that of straight pickling and is used when the fish are being prepared for the European market. Selected fish are cut open along the belly and the viscera and gills are carefully removed. In order that the salt may penetrate the flesh more thoroughly, the flesh on the inside is scored several times. The fish are then carefully washed and rubbed with brushes, after which they are kept on ice for 24 hours. The brine is carefully prepared and very strong. When properly struck the fish are repacked into barrels.

"Kolodka" is a very crude and cheap method of salting. The fish are half salted and half dried without being cut open, and are sold at the place where prepared.

The natives prepare a great many salmon for the winter use of themselves and their dogs, the same as do the Alaskan natives. The fish are dried without the use of salt. The product is known as "youkala."

Some salmon bellies are also cut out and salted, although this has never attained to prominence.

Some fresh salmon, as well as salted, are smoked for local consumption.

Barrels, or tierces, for packing salmon are made from cedar, larch, or fir, with a net capacity of 900 to 1,000 pounds of fish, and are bound with wooden and iron hoops.

VI. THE SALMON FISHERIES OF JAPAN.

Outside of Karafuto (that portion of Sakhalin Island, south of 50° north latitude, which belongs to Japan) and the Kuril Islands, the salmon fisheries of Japan are comparatively small, the principal portion of the immense catches made by Japanese fishermen being along the coasts of Siberia and Karafuto.

All of the five species of salmon found on the American side are to be found in the waters of Sakhalin during the usual spawning periods.

The chum salmon (*O. keta*), which is known in Japan as "sake," and when canned as "pink" salmon, is to be found on Hokkaido Island, running up the various streams for spawning purposes from September to December.

On the same island is to be found also the masu (*O. masou*), a salmon, according to Dr. Jordan,[a] very similar to the humpback, the scales being a little larger, the caudal fin without black spots, and the back usually immaculate. It is fairly abundant in the streams of Hokkaido, the island formerly known as Yezo, and is found nowhere else in the world. The author had an opportunity to examine a dry-salted masu (it might be well to state here that in Japanese masu means "trout") at the fish house of the Royal Fish Co., in Vancouver, British Columbia, in January, 1916. The manager, Mr. Emy, had imported the fish from his own country. Both in size and general appearance it closely resembled a humpback salmon, and when cut open the flesh had the same coloring observable in our humpback. This species, and the true humpback found in more northern waters, especially in Siberia, are dry-salted in immense numbers and are generally marketed under the name of "white trout" or "salmon trout."

In Japan the "red trout" seem to be our rainbow and brook trouts, which were introduced into Japanese waters some years ago. The red salmon (*O. nerka*) is to be found landlocked in Lake Akan in the northern part of the island. It is smaller in size than the sea species. This species has been introduced into the waters of Honshu.

The section of this report devoted to the salmon fisheries of Siberia treats quite fully of the activities of the Japanese in that quarter.

In Sakhalin, or Karafuto, as it is called in Japan, the Japanese have had a rather checkered career. At one time this island belonged to the Chinese Empire. Early in the nineteenth century the southern portion was occupied by the Japanese. In 1875 she bartered it to Russia in exchange for some small islands in the Kuril group. As a result of the Russo-Japanese War the southern half, or all that portion south of 50° north latitude, was in 1905 ceded to Japan.

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[a] Fishes, by David Starr Jordan. p. 296. N. Y., 1907.

The salmon fisheries of this island are of much importance. For many years the Japanese had a virtual monopoly of them, but very early in the present century the Russians attempted to restrict considerably the activities of the Japanese fishermen, and encouraged her own subjects to compete with them. Many hundreds of Russians and Koreans were encouraged to migrate to the island and engage in its fisheries. Despite these handicaps, the operations of the Japanese fishermen, according to the statistics shown below, do not seem to have suffered.

Years.	Salmon.[a]	Spring salmon.	Total.
	Koku.[b]	*Koku.*[b]	*Koku.*[b]
1897	8,589	34,246	42,835
1898	6,335	11,228	17,563
1899	8,379	22,959	31,338
1900	7,719	8,797	16,516
1901	3,089	12,735	15,824
1902	....	....	24,726

[a] Species not specified.

[b] Koku equals about 5⅛ bushels.

Considerable fishing is carried on around the island of Yetorofu, one of the Kuril group. Here are found red (*O. nerka*), silver (*O. kisutch*), and chum salmon (*O. keta*), also either the humpback or Dr. Jordan's masu.

CANNING INDUSTRY.

The salmon canning industry in Japan proper was inaugurated by the Hokkaido Colonization Department, a local branch of the Federal Government. For some time this department had operated a fishery school on Hokkaido Island, at which experimental work in the canning of salmon and other fishery products was carried on. This establishment canned considerable salmon during the Russo-Japanese War.

This same department also established a fishery school on Yetorofu Island, one of the Kuril group, which was, in 1908, taken over by Suhara Kakubei, a fisherman and graduate of the school, and used as a salmon cannery.

Some years earlier, however, about 1892 or 1893, Fujino Shirobei started canneries in Shibetsu and Bekkai, Nemuro Province, Hokkaido Island, and a short time later Idzumi Shozo also started a plant at Nemuro. For a number of years these three canneries were the only producers. The plants were quite primitive, the product small, and most of it was consumed by the Japanese Navy. A demand for the product was gradually worked up, however, and as a result there are now a number of small canning plants on Hokkaido

Island proper, the Kuril Islands, and Japanese Sakhalin. Most of these plants devote the major part of their energies to the packing of crab meat, the canning of salmon being in most cases a side issue. A few of the plants have been equipped with machinery, but the large majority are hand-pack plants, employing but a few persons.

Most of these plants pack what is called "white trout," which is really the humpback or masu salmon. In 1912 there were in Hokkaido and adjacent islands 21 canneries which packed 730 cases (48 one-pound flat cans each) of red (*O. nerka*) and 72,770 cases (48 one-pound cans each) of "white trout," a total of 73,500 cases.

On the Japanese portion of Sakhalin Island 4 canneries packed 10,120 cases (48 one-pound cans each) of "white trout" in 1912.

The pack of canned salmon in Japanese territory in recent years has been as follows:

Years.	Hokkaido and Kurils.	Karafuto (Japanese Sakhalin).	Total.
	Cases.	*Cases.*	*Cases.*
1912	73,500	10,120	83,620
1913	46,000	....	46,000
1914	50,450	15,000	65,450
1915 (estimated)	55,000	15,000	70,000

The following table shows the quantities and value of salmon and trout taken by the Japanese fishermen in certain years:

Years.	Salmon.		Trout.	
	Pounds.	Yen.	Pounds.	Yen.
1902	5,722,475	454,662	923,025	121,499
1907	9,286,267	892,879	4,500,008	332,316
1912	26,438,017	1,594,230	44,038,383	928,513

FISHERY METHODS.

In Japanese waters salmon are taken by means of trap nets, haul seines, and gill nets.

The haul seines used along the seashore have a length of about 500 fathoms. Each is carried by a boat of 9 feet beam with 30 men, and the right wing, called the "outing wing," is first paid out as the boat heads out from the beach. When the pocket, or bunt, is cast, the boat turns its course toward the right and steers gradually landward, casting the left wing. When the school is encircled the seine is hauled ashore by the seine ropes.

The floating trap net used for salmon is known as "kaku-ami," or square trap net. This consists of a main net and lead. The main net, or heart, is 70 fathoms long, 10 fathoms wide, and 10 fathoms deep, and the lead is 120 fathoms long. The latter guides the fish toward the main net. When being fished the pot is hauled up by a boat crew and the fish transferred to the boat by means of a dip net.

FISH CULTURE.

The artificial culture of salmon is carried on in 56 hatcheries, which are distributed in Hokkaido and the prefectures of Aomori, Akita, Yamagata, Niigata, Toyama, Kyoto, Iwate, and Miyagi. Nine of these belong to the government of Hokkaido and other prefectures, while the rest are owned by fishing associations, individuals, or corporations. The number of young salmon distributed by these hatcheries amounts to over 80,000,000 a year.

The largest hatchery is the one at Chitose, under the supervision of the Hokkaido Fishery Experimental Station. It was established in 1887, and it is estimated that the fish distributed by it number from 20,000,000 to 30,000,000 yearly.

The salmon hatchery of Murakami, Niigata prefecture, dates as far back as 1881, when a regulation pertaining to the preservation of young salmon in the River Miomote was enacted by the prefecture of Niigata. This was first called the "Murakami Salmon Raising Plant," but in 1891 it was turned into a hatchery, and is now distributing 2,000,000 young salmon a year. The salmon hatchery of Nitta River, Fukushima prefecture, is very similar in its history and organization to the above.

The industry has during the last few years become very popular in Yamagata prefecture, where 22 hatcheries are in operation as private enterprises.

In the prefectures of Shiga, Miye, Shizuoka, Nagano, Yamanashi, Kanagawa, Akita, Niigata, Hyogo, Miyazaki, and Hokkaido, the masu (*O. masou*) and the landlocked hime-masu (*O. nerka*) are raised and distributed in the lakes and rivers. There are eight hatcheries working on these species. The hatchery of Lake Towada, Akita prefecture, first transplanted hime-masu from Hokkaido in 1902, and it is now hatching from 5,000,000 to 10,000,000 eggs a year for the purpose of distributing the fish among the different districts.

VII. METHODS OF PREPARING SALMON.

CANNING.

EARLY DAYS OF THE INDUSTRY.

In the salmon industry canning is, and has been almost from the time of the discovery of a feasible method of so preserving the fish, the principal branch. The first canning of salmon on the Pacific coast was on the Sacramento River in 1864, when G. W. and William Hume and Andrew S. Hapgood, operating under the firm name of Hapgood, Hume & Co., started the work on a scow at Washington, Yolo County, Cal. The Hume brothers, who came from Maine originally, had been fishing for salmon in the Sacramento River for some years before the idea of canning the fish had entered their minds, while Mr. Hapgood had previously been engaged in canning lobsters in Maine, and was induced by the Humes to participate in order that they might have the benefit of his knowledge of canning methods. The late R. D. Hume, who worked in the original cannery, and later became one of the best-known canners on the coast, thus describes the plant and the methods employed:[a]

> Before the arrival of Mr. Hapgood [from Maine] the Hume brothers had purchased a large scow, on which they proposed to do the canning of salmon, and had added an extension to the cabin 18 by 24 feet in area, to be used as a can-making shop. This had a shed on the side next to the river for holding any cans that might be made in advance of the packing season. A few days after the arrival of Mr. Hapgood [March 23, 1864], the tools and machinery were packed and put in position. Mr. Hapgood made some stovepipe and two or three sheet-iron fire pots, and in a short time was ready for can making. The following list of tools and machinery will show how primitive our facilities were as compared with present methods: 1 screw hand press, 1 set cast-iron top dies, 1 set cast-iron bottom dies, 1 pair squaring shears, 1 pair rotary shears, 1 pair bench shears, 1 pair hand shears or snips, 1 pair 24-inch rolls, 1 anvil (weight 50 pounds), 1 forging hammer, 1 tinner's hammer, 1 set punches for making stovepipe, 1 rivet set, 1 grooving set, 2 iron slabs grooved on one side to mold strips of solder, 1 iron clamp to hold bodies of cans while soldering the seams, 1 triangular piece of cast iron about three-eighths of an inch in thickness and 6 inches in length, with a wooden handle attached to the apex, also used for holding can bodies in place while being seamed.
>
> The process of canning was as follows: The bodies of the cans were first cut to proper size by the squaring shears, a line was then scribed with a gage about three-sixteenths of an inch from one edge, and they were next formed into cylindrical shape by the rolls. They were then taken to the soldering bench and one edge lapped by the other until

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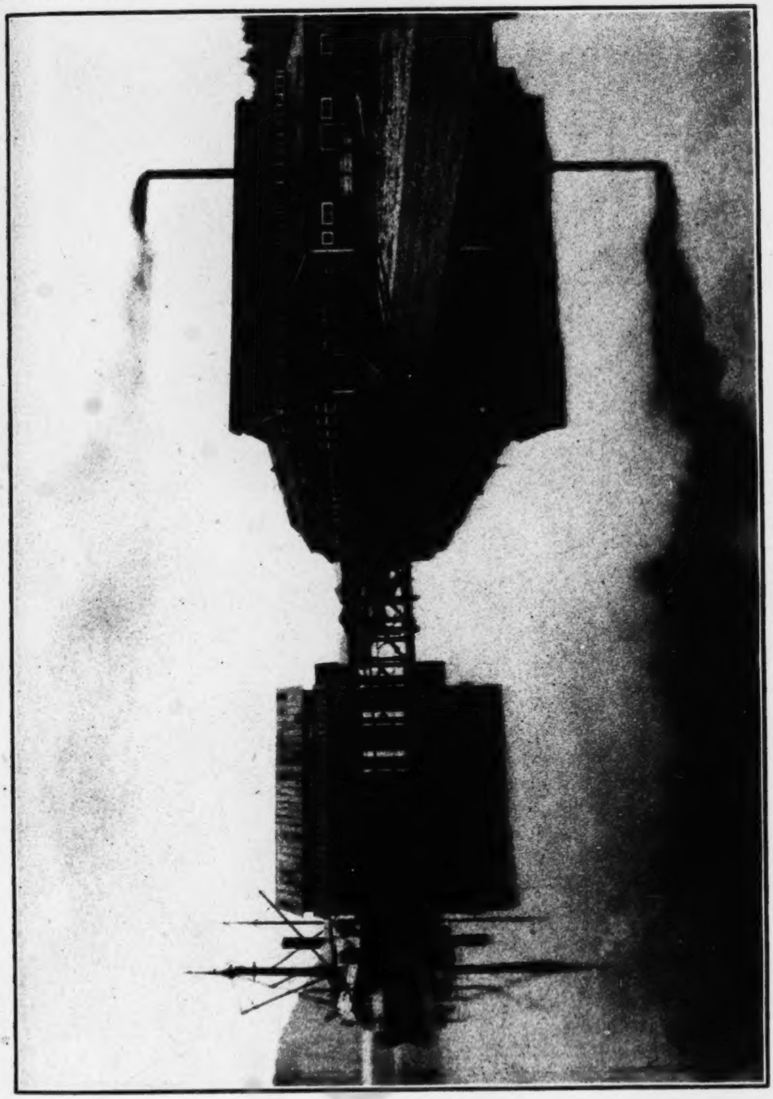
[a] The first salmon cannery. By R. D. Hume. Pacific Fisherman, vol. II, no. 1, January, 1904, 19-21.

PLATE XIV.



CANNERY, HOONAH, ALASKA.

PLATE XV.

CANNERY, SANTA ANA, ALASKA.

the edge met the line that had been scribed and fastened there by being soldered a small part of the length to hold them in place for the further purpose of seaming. They were then placed either in the iron clamp, which had a piece of wood attached to its under side, and held firmly, the clamp being closed by the operation of a treadle, or were slipped on a piece of wood, which was bolted to the bench, while being held in place by the triangular hand seamer, which was pressed down on the lap of the seam by the left hand of the operator. When this had been done a piece of solder, which had been prepared by shaking in a can together with rosin, was placed on the seam and melted and rubbed lengthwise of the seam. After cooling the bodies were ready for the end or bottom, which operation was brought about by first cutting out circular blanks with the rotary shears, and then placing them in the cast-iron die and bringing the handle of the screw press around with a swing with force enough to form up the end or bottom. In this operation there were many difficulties, as the ends or bottoms would many times stick to the upper part of the die and refuse to come off, and finger nails were pretty short in those days. To get the ends out of the lower part of the die was not so bad, as a wooden plunger operated by a treadle knocked them out, but sometimes they were in pretty bad shape. When the bottoms or ends were ready they were slipped on the bodies and the edge of the bottom rolled about in a pan of powdered rosin until the seam was well dusted. A piece of solder similar in size and preparation as used for the side seam was placed in the can. It was then placed on the smooth side of the cast-iron slabs, and the operator, with a hot soldering copper shaped to fit the circle of the can, melted the solder and by turning the can rapidly soldered the full circumference. The output of this can factory was very imperfect, as at least one-half of the seams burst, owing to the lack of experience of the manager or want of good judgment.

When the can making was well underway Mr. Hapgood then turned his attention to getting the apparatus for canning on board the house-boat. This in the cooking department consisted of a kettle made of boiler iron about 36 inches in diameter and 5 feet in depth, set in a brick furnace and fired from underneath. Alongside was a round-bottom, cast-iron pot holding about 60 gallons of water and heated in the same manner. These kettles, with a dozen coolers or circular sheet-iron pans with ropes attached and with holes cut in the bottoms for drainage, a set of 5-inch blocks and tackle, with a sheet-iron fire pot and a scratch awl, completed the bathroom outfit. The can filling and soldering room was furnished with a table through the center, where cutting the salmon in pieces to suit and the filling of the cans was done. On each side of the room there was a bench running the full length, on the end of one of which the cans were placed to receive the pickle, which was used at that time instead of the small quantity of salt that is placed in the cans during the operations of these later days. After the salmon had been cleaned by removing the entrails and washing them outside the covered portion of the scow, they were brought inside and placed on the table, and a man with a butcher knife in one hand and a stick in the other, which had a mark showing the length of the pieces desired, cut gashes in the side of the salmon as a guide and then cut the fish into sections corresponding to the length of the mark on the stick. He then proceeded to cut the sections in pieces to suit the cans. Then three or four operators placed the salmons in the cans and shoved them along the table to where a boy wiped the top edge and passed them along to two others who placed tops which fitted inside of the rim. The cans were then taken in wooden trays to the bench opposite the starting point, which was fitted with four sheet-iron pots, and at the one nearest the entrance to the house on the scow a man put a soldering flux on the top edge, which was made by adding zinc to muriatic acid, and then with a pointed soldering copper and a stick of solder melted the solder until a small portion could be drawn around the groove formed by the edge of the can and the bevel of the top. From there the cans were taken to the other parts of the bench, where two men finished soldering the head in, and then taken to the third man, who soldered, or, as it was called, buttoned, the end of the seam lap. The cooking department or bathroom, as it was called, was separated from the filling and soldering room by a partition. The cans were shoved through a hole in the partition.

At this time the process was a secret. Mr. Hapgood did the cooking and all the work done inside, no one but a member of the firm being allowed to go in. This privacy was continued until the firm moved to the Columbia River and, the labor becoming too arduous for Mr. Hapgood to perform alone, a boy by the name of Charlie Taylor was taken in as an assistant. * * *

But to return to the original proposition: When the filled cans had been soldered and entered the bathroom they were put in the coolers and lowered into the cast-iron pot, one cooler of cans being cooked at a time. The cooler was lowered into the boiling fresh water until the cans were submerged to within 1 inch of the top ends and left to cook for one hour; then they were hoisted out and the vent holes in the center of the top soldered up, after which they were dumped into the boiler-iron kettle, which held a solution of salt and water of density sufficient to produce, when boiling, a heat of 228° to 230° F. They were cooked in this solution for one hour and then taken out of the kettle with an iron scoop shaped like a dip net, with a wooden handle about 6 feet in length. They were dumped into a tank of water on the other side of the partition which separated the bathroom from the packing room through an opening in the partition, receiving many a bump and bruise in the operation. Then they were washed with soap and rag to remove the dirt and grease, each can being handled separately. When this was done they were piled on the floor of the packing room and in a few days were painted with a mixture of red lead, turpentine, and linseed oil, for at that time buyers would have no canned salmon, no matter how good the quality, unless the cans were painted red.

When packs of 10,000 to 15,000 cases were made in a season only the absolutely essential machinery was used, the rest of the work, such as cutting and cleaning the fish and placing them in the cans, being done by hand. When larger canneries were constructed, especially in Alaska, where labor is expensive and difficult to obtain, the greater part of the workmen having to be brought up from the States, machinery to do as much as possible of the work became absolutely essential. The inventive genius of the country came to the rescue and one by one machines for cutting, sliming, and cleaning the fish, filling the cans, putting the tops on, and washing them were invented and put into use, while automatic weighing machines were produced and extensive improvements and alterations were made in the machines previously in use. There are to-day many large manufacturing establishments which devote all or the greater part of their facilities to furnishing machinery and supplies to this giant branch of the salmon industry.

When salmon canning was in its infancy a pack of from 150 to 200 cases was considered a good day's work. Now it is not an uncommon occurrence for a cannery to turn out from 2,500 to 4,000 cases in one day, and there are a number which have even greater capacity.

During the height of the salmon run, a cannery is an exceedingly busy and interesting place, and a description of the methods used at the present time will show the giant strides the industry has made since the days of Hapgood, Hume & Co.

HANDLING THE SALMON.

At convenient spots near the fishing grounds large scows and lighters are anchored and the fishing crews deliver their catches aboard these, the tallyman on each scow keeping a record and giving the crew a receipt. Men fishing near the cannery deliver their catch alongside. Steamers and launches are used to tow out empty scows and bring in those filled. In the old days the fish were pitched by hand into bins on the wharves, but this laborious method has been superseded by the use of an elevator, which extends from a short distance above the top of the wharf to the water's edge, provision being made for raising or lowering the lower end according to the stage of the tide. This elevator is slanting, and is made of an endless chain operating in a shallow trough. About every 2 feet there is attached to the chain a crosspiece of wood. At the top of the elevator are chutes which deliver the fish at various convenient spots on the cutting-room floor.

At a few places tracks have been run down to the low-water stage and the steamers, launches, and scows come alongside. Small cars are run down to the vessels, to be filled by men pitching the fish from the boats, and the cars when filled are run up to the cutting room and dumped upon the floor. At other places men armed with pews (single-tined forks) pitch the fish up to the wharf, where other men pitch them to the cutters.

If the salmon have been in the scows from 20 to 24 hours they are used as soon as possible after being delivered at the cannery; otherwise that length of time is usually allowed to elapse, the cannerymen claiming that if not allowed to shrink the fish will be in such condition that when packed much juice will be formed, so that in "blowing," after cooking in the old-style method, light-weight cans will be produced.

Before dressing the fish a stream of water is kept playing over them in order to remove the dirt and slime, after which men with pews separate the different species into piles convenient to the dressing tables.

DRESSING.

A number of the small canneries still use the old hand method of dressing the fish, and in such places the selection of the butchering or dressing gangs is of prime importance. Two men constitute a "butcher's gang," and the number of these gangs is dependent upon the output of the plant. Boys place the fish, with the head out, upon the cutting tables. One man cuts off the heads, and is followed by another who removes the fins, tails, and viscera. The offal is thrown into a chute, whence it passes into the water under the cannery or into a scow moored underneath, while the dressed fish is transferred to a tank of water, to be scaled, washed, and scraped. It is then passed to another tank of water, where it receives a second washing, scraping, and final brushing with a whisklike broom, which removes any offal, blood, and scales that were overlooked in the first washing, after which it is removed to large bins on either side of the cutting machine.

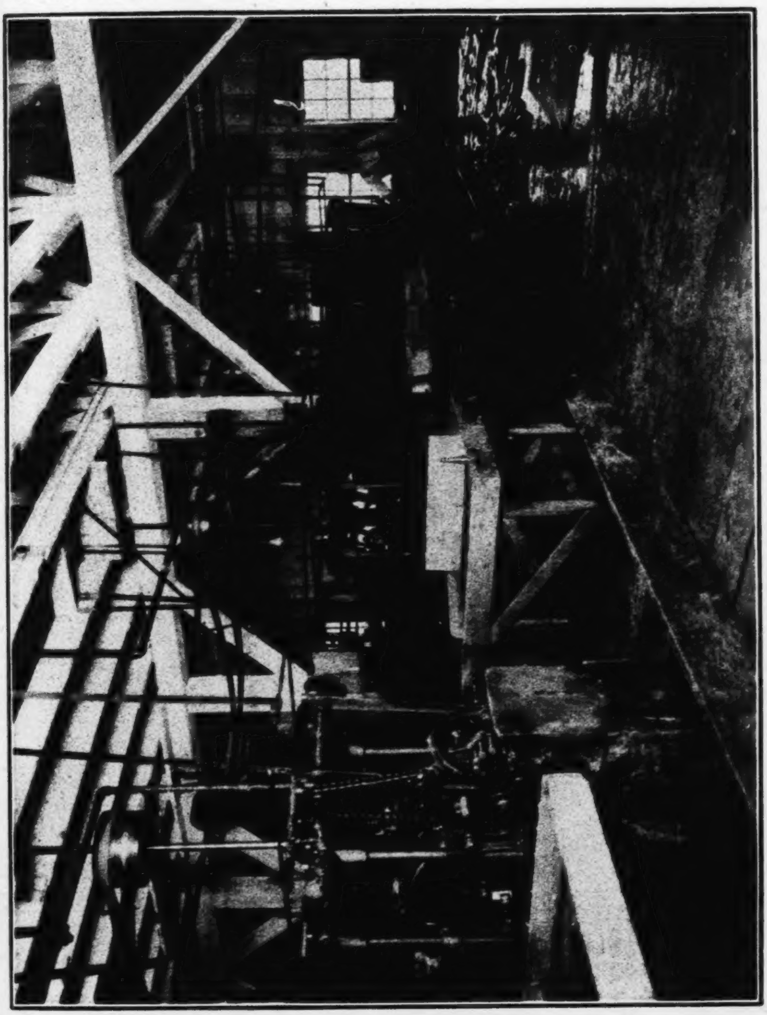
The most useful cannery inventions in recent years have been of machines for doing the work of the dressing gangs. Several have been invented and work more or less satisfactory. The one commonly known as the "Iron Chink," now in general use in canneries where such machines are employed, was first used in 1903 at Fairhaven (now Bellingham), Wash. It removes the head, tail, and fins and opens and thoroughly cleans the fish ready to cut into pieces for the cans. By the use of these machines the dressing gang is almost entirely done away with, dispensing with 15 to 20 men. This same machine is now so arranged that the fish after dressing are also "slimed"; i. e., the thick mucus covering the skin removed.

CUTTING.

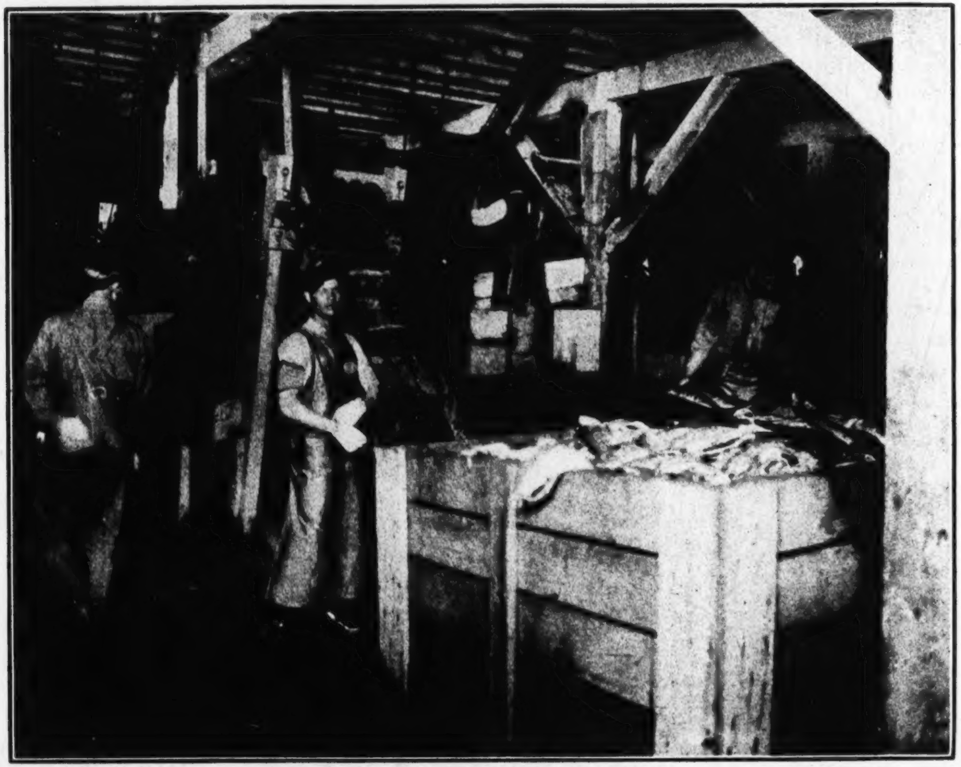
The usual method of cutting the salmon is by a machine. This is generally a large wooden cylindrical carrier, elliptical in shape, thus having a larger carrying capacity. Ledges or rests on the outside the length of the carrier are wide enough to hold the fish, and are slit in cross section through the ledges and outer casing to receive the gang knives. The latter are circular, fixed on an axle at the proper distances apart, and revolve at the highest point reached by the carrier and independently of the latter. The carrier and gang knives are set in motion, each revolving on its own shaft. As a rest on the carrier comes to a horizontal position, men stationed at the fish bins lay a fish on each ledge as it passes. Thence it is conveyed to the revolving gang knives and, after being divided, passes through on the downward course, sliding off the rest into the filling chute. The knives in these machines are so arranged as to cut the fish transversely in sections the exact length of the cans to be filled.

The rotary cutter shunts the tail pieces to one side, and these are carried by means of a chute to baskets. The tail pieces are canned separately. As the tail portion is much smaller, with less meat, it can not be placed in the cans with the middle and head sections without detracting from their value, but if packed under a distinct and separate label, as is now done, there is no reason why the tails should not supply the demand for a cheap grade of fish.

In some of the smaller canneries, especially in those packing flat cans, the gang knives are worked by hand. In this case the knives are not circular, but elongated or semicircular in shape, tapering at



A BATTERY OF "IRON CHINKS."



CUTTING SALMON INTO PIECES TO FIT THE CANS.

the outer ends. They are mounted on an axle having a large iron lever at one end, and when this lever is raised the ends of the gang knives are thrown up and back. The fish is then placed in position under them and the lever pulled forward, the knives, with a scimitar-like movement, dividing the fish.

The original method of cutting was by means of a long knife wielded by a Chinaman who stood at a regular butcher's block. Although his strokes were incredibly quick, the rotary cutting machine is a vast improvement over the old way.

SALTING.

Every can of salmon is seasoned with one-fourth of an ounce of salt, which, to insure uniformity, is added by mechanical means. A table is used, in the top of which are holes equal distances apart. On the underside of the top is a sheet-iron plate, with an equal number of holes, which slides in a groove at the sides, and is worked either by a hand or foot lever. Just below is an open space large enough to accommodate a tray holding 36 or 48 cans. A workman stands in front of the table and slides a tray of cans into the open space. He then throws a quantity of salt upon the table and immediately scrapes this off with a thin piece of wood, each hole being filled in the operation, and the salt being prevented from falling through by the iron plate underneath. The lever is then pressed, the iron plate moves forward until the holes in it are directly under the table top, when the salt drops through into the cans. This operation can be repeated four or five times in a minute. Some canneries now use a small salter attached to the filling machine and this deposits the required amount of salt in the can as it is passing by on its way to be filled.

FILLING THE CANS.

Most canneries now use filling machines, although a few, more particularly those packing flat and odd-sized cans, still fill by hand.

The filling machine consists of a chute with a belt to which are attached wire racks about 4 inches apart, set at an angle to prevent the salt from spilling out, into which the salted cans are fed from the floor above and pass into the machine. At the same time the divided sections of salmon pass down another chute into the mouth of what looks like a hand coffee mill. They pass through here down a smaller chute and are forced by two dogs into a receptacle through which the plunger, or filler, passes. Here the plunger comes opposite the open mouth of the empty can, which when it reaches this point is caught by a clasp or hook and held in front of the plunger, which is immediately thrust forward through a chamber filled with salmon, cutting the fish longitudinally and at the same time filling the can.

The next movement forces the can out upon a table. When running at full speed, one of these machines will fill about 80 cans a minute.

On being released by the clamp the cans roll upon a long table and are picked up by a man stationed here, who strikes each one upon a square piece of lead set in the table, in order to settle the contents down into the can and for the purpose of detecting any deficiency in weight. If not quite full the cans are pushed to the other side of the table, where a woman or man adds the quantity of fish needed, a supply of small pieces being kept at hand for this purpose. Generally the cans overrun in weight, frequently as much as an ounce. Occasionally a can is weighed in order to see that the machine is in perfect adjustment. In many canneries weighing machines are arranged in the "line" and these throw out the short weight cans.

In the hand method the fillers stand on each side of a long table with a trough running down the middle from end to end. This is filled with the cut pieces of salmon, and the fillers, usually women and children, put into the cans large pieces at first and then smaller pieces to occupy the vacant spaces.

WASHING THE CANS.

In the old style method the cans are put upon an endless belt by a workman and pass from the filling-machine table to the washing machine. This is a rotating apparatus, consisting of an iron framework holding 10 rests or stands on which the cans sit. Immediately overhead are small perpendicular shafts with an iron cap, the diameter of a can, fixed to the end of each. Each can as it reaches the machine is caught by one of the washers and the cap brought down over the top, a tight-fitting flange preventing water from getting inside. Revolving rapidly as it goes, with a stream of water against it of sufficient force to remove the dirt and grease, the can is carried until the machine has revolved 180 degrees, when it is released and passes out on a belt. A more modern method is to use jets of steam for washing, while one of the latest devices is to clean the cans by a cold-air blast which strikes directly on the top edge. A set of brushes against which the cans revolve is used in a few canneries.

After being washed the cans continue on an endless belt and pass two children whose duty is to put a small piece of scrap tin on the top of each. These pieces are called "chips," are from 1½ to 2 inches, and are scraps from the sheet tin used in making the tops of the cans. The shape is of no particular importance so long as the pieces are long enough to cover the hole in the top of the can, or the cap as it is called.

CAPPING.

The endless belt delivers the can to the capping or topping machine. On reaching this the can passes under a cap holding a top, the latter being fed in through a separate aperture, and the cap immediately falls with just sufficient force to put the top on the can without injuring either. The can is then forced out from under the capper by the rotation of the machine, and the next capper is brought around to receive another can. As the cans revolve they are carried under a crimper, situated directly opposite the capper, which presses the edge firmly around the body. While one can is being topped another is being crimped, after which it rolls out upon a belt on its side, and is taken through the acid trough. Before the tops are sealed the edges must be treated with a solution of muriatic acid, which is in a glass receptacle and is applied just before the cans are rolled through the acid trough on the endless belt.

SOLDERING.

For many years the tops and also all other parts of a can were soldered by hand, a long, tedious, and expensive process, which eventually gave way to the soldering machine. This is composed of an endless chain about 6 feet long, revolving around two shafts at either end of an iron trough. In the bottom of the trough is the solder, which is kept at molten heat by a row of oil blast jets underneath. Between the lower part of the chain and trough is just enough room for the cans to pass without jamming, and they are forced along the trough by a chain in contact with their sides. They enter the trough at an angle, their bottoms slightly inclined, which causes the top rim to be submerged in solder, thus distributing it evenly all around the edge.

In passing through the trough the cans make about half a dozen revolutions, which cause the tops to become very hot, and it is to prevent them from being blown off by the pressure of the steam which quickly generates that the center hole in the top is made. The "chip" previously mentioned prevents the hole from being choked with salmon.

A soldering machine having, instead of the endless chain to give motion to the cans, a metal spiral running the length of the machine and revolving on an axle through the center, is used in some canneries. Each loop grasps a can and follows it to the end, thus giving the cans the proper motion and preventing them from rolling side by side and lapping the solder over the ends, as is frequently the case with the chain machines.

A few canneries use a revolving cooler, which has a disk upon which the cans rest. This disk is filled with running water, and after it makes two revolutions the cans are forced into an inclined trough under a stream of water. The usual method, however, is for the cans on leaving the soldering machine to pass under several jets of water to set the solder and at the end of the belt to be transferred by workmen to coolers or crates, which are made of flat strap iron, square shaped, and holding about 96 cans. The cooler having been filled, it is placed upon a square truck and rolled aside, where the vent holes are stopped with a drop of solder.

TESTING.

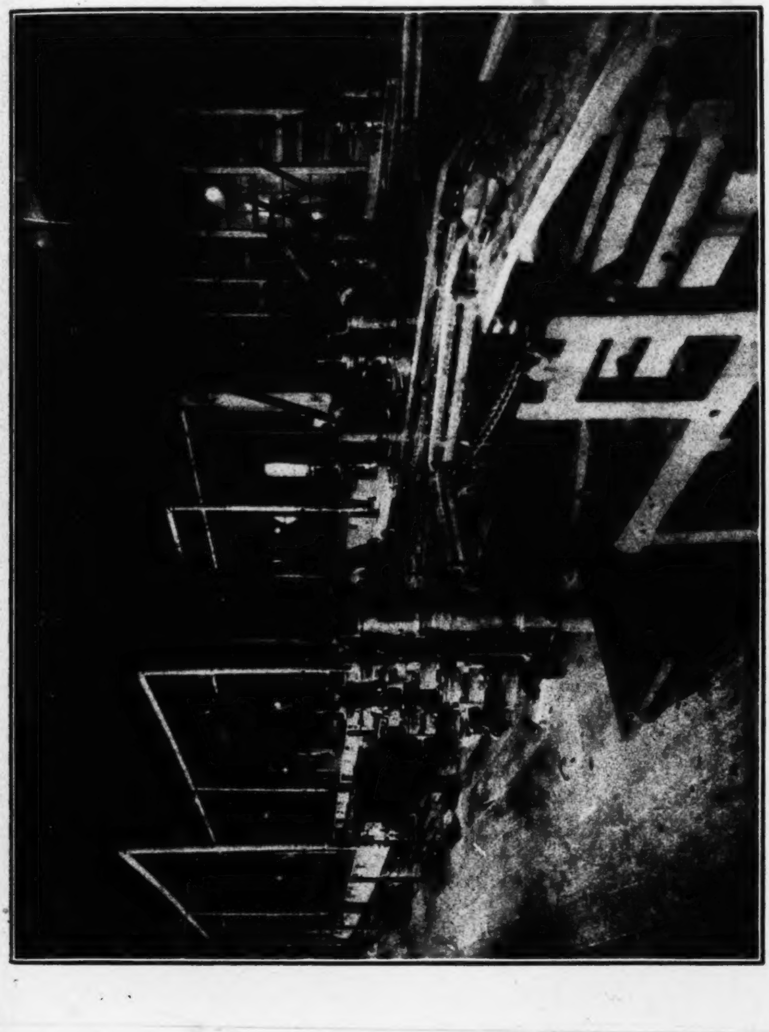
The testing tank is a square wooden tank filled with water heated almost to the boiling point by steam pipes arranged in a coil at the bottom. The coolers are hoisted into the test tank by a block and tackle attached to an overhead track, which permits them to be swung to any place desired.

This test is for the purpose of detecting leaks due to imperfect soldering and is conducted by two workmen skilled in this operation. The slightest leak is detected by the appearance of small bubbles issuing from the cans. The spots where the bubbles appear are marked with a small iron tool held in the hand, and the cans are taken out and placed in small wooden trays, in which they are carried to the bench men, whose duty it is to mend them. Cans that have been mended are again tested as before. The bench men are located in front of a long bench on which are numerous fire pots, supplied with oil and air led through small tubes, in which the soldering irons are kept heated, the heat and air being regulated by connecting valves. Kerosene oil and gasoline are the fuels generally used now.

COOKING.

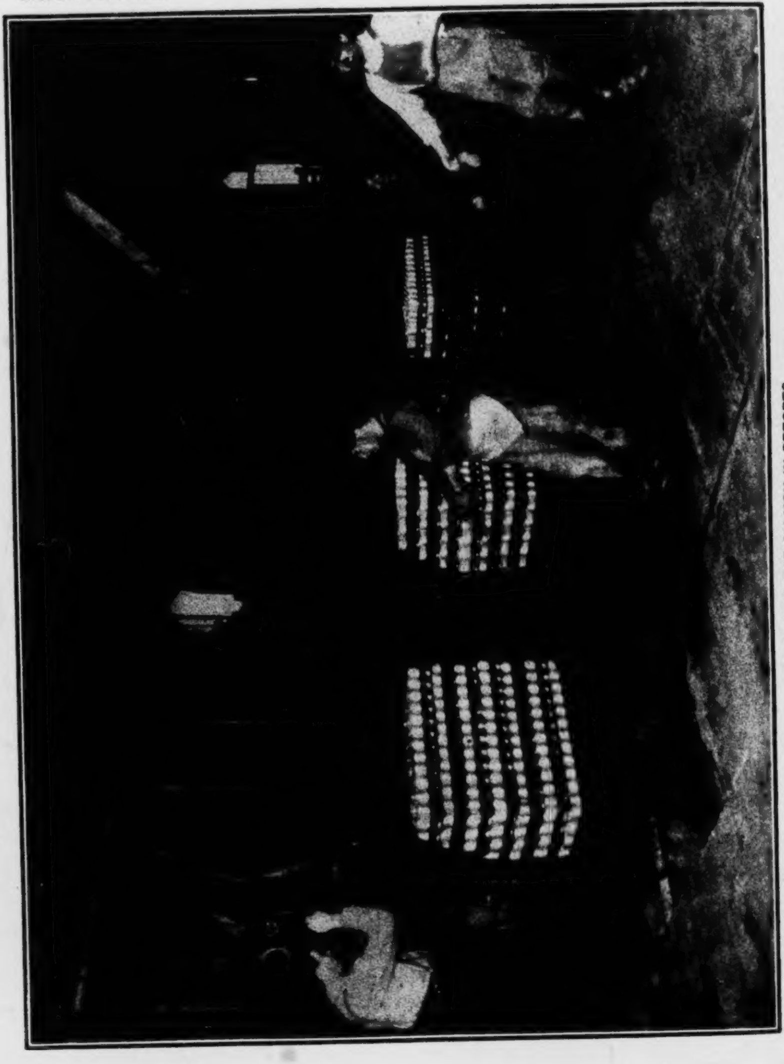
The salmon are invariably cooked in rectangular retorts which rest in a bed and have a track running the long way. In front of each is a turntable for the purpose of receiving trucks coming from any direction. Four trucks, each holding 6 coolers of cans, piled one upon another, are run into the retort, which is then closed and steam turned on, entering at the bottom. The amount of pressure is from 6 to 12 pounds, the heat 250° F. In most establishments the first cooking is continued about 60 minutes.

After the first cooking the coolers are taken out and placed on a long table called a "venting table," where the cans are pricked with a wooden-headed hammer fitted with a small brad, to allow the steam and superfluous water to escape. After the venting has been done the holes are soldered up, the coolers again loaded on a truck and rolled into the second retort, where they are subjected to the same pressure of steam and heat as in the first cooking and for a period of about 60 minutes.



EXHAUST BOXES AND THE DOUBLE SEAMERS.

PLATE XIX.



COOKING THE SALMON IN RETORTS.

In some canneries the retorts for first cooking are made of heavy plank, well bolted to resist the steam pressure.

In the early days much secrecy and mystery was thrown about the cooking, and the work was carried on in a separate room, known as the "bathroom," under lock and key. The first cooking was done in common tubs. The early retorts were made of wood. Later, round iron kettles were substituted, nearly one-half consisting of cover, and round crates were used for holding the cans.

For many years cannery men believed that the double cooking of salmon was absolutely necessary, but in 1898 F. A. Seufert, at his cannery on the Columbia River, at Seuferts, Oreg., a short distance above The Dalles, discarded this idea, and has since used a one-cooking method. By the new process the cans are tested for leaks after the center hole in the top is soldered up, as before, and are left in the retort 70 minutes at 245° F. and 12 pounds steam pressure. According to its originator, this method saves more than one-half the labor in the bathroom, saves nearly one-half the labor in washing the cans after cooking, and also better retains the color of the fish.

SANITARY CANS.

A comparatively recent improvement in the salmon-canning business, and one which accomplishes the same purpose as the single cooking in retorts, is that of "sanitary cans," so called. These cans are now used by the majority of the salmon canneries. In order to use these cans a quite radical, but economical, change in machinery is necessary. As the cans leave the filling machine they pass to the clinching machine, which attaches the top of the can loosely to the body in such a way that it allows the gas in the can to escape, yet prevents the fish from coming in direct contact with the steam of the exhaust box. In this way the condensed steam which accumulates in the exhaust box is kept from entering the can, thus keeping water out of the can. This overcomes the difficulty caused by the bleaching of the fish.

The cans then pass into a steam exhauster, consisting in one type of a box about 30 feet in length, in which are three endless-chain belts running side by side. Under and over each belt are steam coils, and under each of the lower coils are single pipes, which through small holes throw jets of live steam upon the coils, creating an intense heat. The cans pass along the first belt, are then transferred to the second belt, on which they return to the entrance of the box, whence they pass to the third belt, and continuing along this to the end pass out to the topper and crimper, the whole operation occupying from 5 to 15 minutes' time. One style of exhauster has 10 ovals formed by the pipe, and the cans pass along these from side to side of the exhauster until discharged at the far end. Upright exhausters, in which the cans travel along a spiral, are also in use. By this means the contents of the can are heated and the greater part of the air exhausted, which is the object of the first cooking in the retort under the method formerly in general use.

A recent invention, which the inventor claims will do away with the steam exhaust box, and thus save a large amount of valuable floor space in the canning "line," is the power vacuum pump, known as vacuum exhausting machine, by means of which air is exhausted from the cans, accomplishing the same purpose as the steam exhaust box. Some of these machines have been in active use for several seasons, with most satisfactory results.

Leaving the exhauster the cans pass to the double seamer, which fastens the cover on tightly with a double seam or crimp. It should be stated that no solder is used in attaching the top on the can, the curled flanges of the cover being coated around the outer edge with cement or other sealing fluid to take its place. Solder, however, is used in joining the side seam of the can, this being done when the can is manufactured. The cans then leave the machine on an endless conveyer and pass to the men who transfer them to the coolers, and these are immediately placed upon the trucks and run into the retort for the one cooking they are to receive. The time they are to remain here is somewhat variable, 70 to 125 minutes with a temperature of 242° F. being the common period.

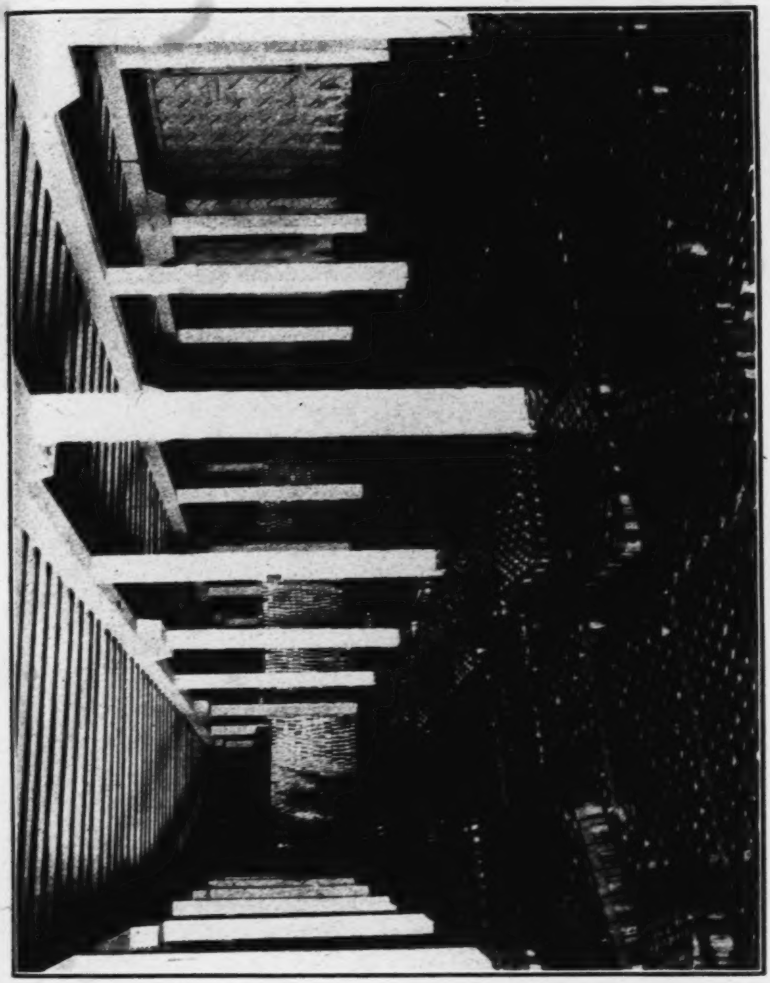
By the use of these cans the soldering machine is done away with. It also does away with the first cooking and the subsequent venting and soldering, a saving both in labor and time consumed.

REPAIRING CANS.

Imperfect cans which are repaired before the first cooking are naturally in the same condition as if there had been no defects. If the leaks are discovered after cooking and are repaired at once and the contents recooked, they are still very good, the only difficulty being that by blowing or venting them a second time they lose weight. The above goods usually go in with the regular pack of their kind and are not classed as regular "do-overs."

When, however, a cannery is running at full capacity, defective cans can not always be repaired and recooked at once and are sometimes set aside for days. Decomposition follows, of course, as with any other meat that is exposed to the air, and the fish becomes unfit for food. When recooked the meat becomes mushy and the blowing or venting makes the cans very light, a defect which is frequently corrected by adding salt water. This, the "do-over," is the lowest class of goods. In the old days, and even yet to some extent, such cans are sold without labels to brokers, or else are given some indefinite label, and sold in the lumber, mining, or negro districts, or

PLATE XX.



FILLED SALMON CANS COOLING.

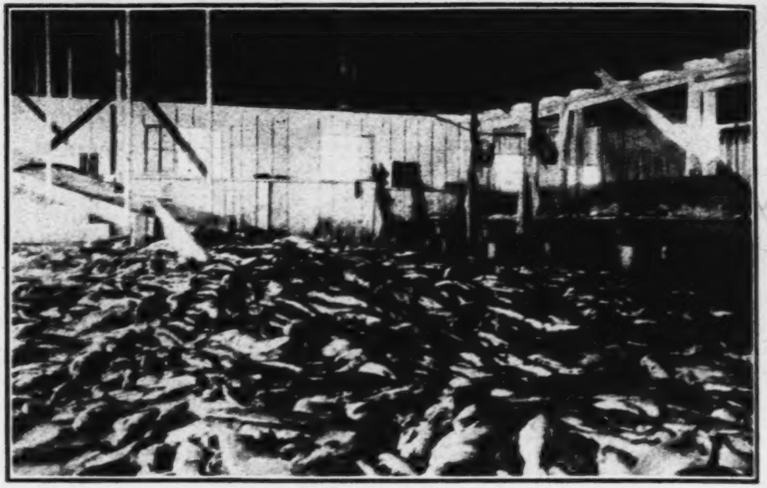


FIG. 1.—SALMON ON THE FLOOR OF THE CANNERY DRESS HOUSE.

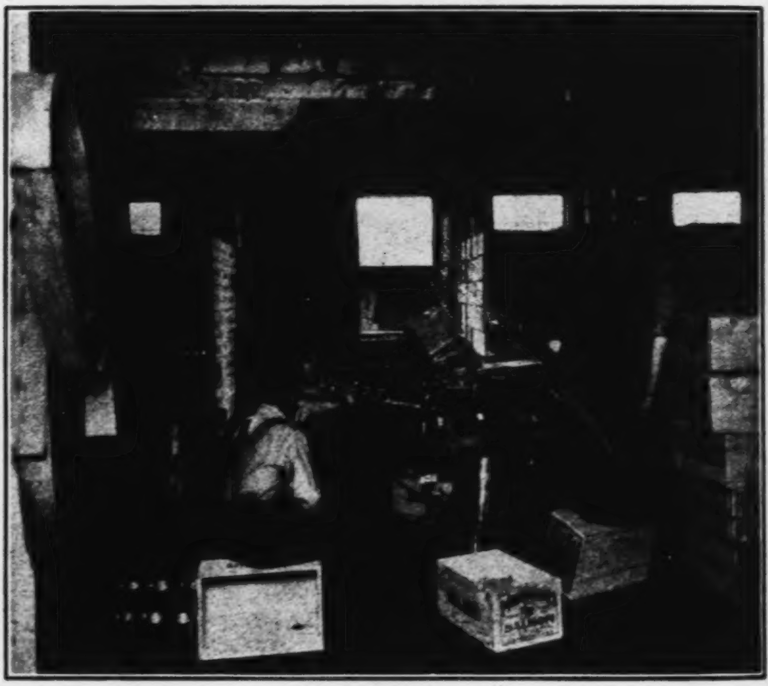


FIG. 2.—SALMON CAN-LABELING MACHINE.

shipped to foreign countries with less fastidious tastes in the matter of salmon. In 1910 one of the leading companies of Alaska adopted the policy of throwing overboard all "do-overs."

On coming from the second retort the coolers are lowered into a bath of lye, or, as in some canneries, the cans are run through such a bath on an endless belt, which, with the aid of a slight rinsing and a few rubs with a brush over the top, removes from the can all the grease and other material. The belt then passes them into another bath where the lye is washed off in hot fresh water. The cans then go to the cooling room, where a stream of water is played upon them, or, during rainy weather are placed out of doors upon the wharf, and there allowed to cool.

The top and bottom of the cans contract in cooling, and for several hours a sharp popping noise is heard. Here, as in nearly every process through which they pass, the cans are again tested, this time by tapping the tops with a small piece of iron about 6 inches long, or, sometimes, a 12-penny nail. The sound conveys to the ear of the tester an unmistakable meaning as to the condition of the can, and the faulty cans that escape notice during the other tests are almost invariably found in this one.

LACQUERING.

An almost universal custom in the salmon-canning industry, but one that is not common in the canning of vegetables, fruits, etc., is that of lacquering the cans. This idea of protecting the can on the outside has been followed from the very beginning, for two reasons: (1) That the English market which, at that time especially, absorbed the greater part of these goods, insisted on their shipments being finished in this way, and (2) from the fact, as these canners speedily found out, that if they did not protect their cans in some way enormous losses through rust would ensue.

The first experiment of this nature was to paint the cans by hand with red paint, treating each singly. Next a composition of logwood extract and alcohol was tried, which, however, did not produce satisfactory results for a very plain reason—the can was dyed instead of being lacquered. The next attempt was to varnish the cans with a japan varnish reduced with alcohol, but this was found to dry too slowly for speedy handling. After extended experimentation the quick-drying brown lacquer of the present time was evolved, which carries asphaltum in the form of an asphalt varnish as its base, this being supplanted in some cases by gilsonite. This lacquer can be procured in either a heavy or light body, is generally reduced with benzine or gasoline, and is applied according to the requirements of the market, which in some localities demands a heavy coating and in others a much lighter finish, the latter giving a rich golden brown color. Some experiments have also been made in using brighter colored lacquers for this work. Several of these, made to give a bright golden, copper, or other color, are extremely attractive in appearance, while at the same time protecting the tin against rust quite as well as the brown.

The industry soon outgrew the hand method of lacquering, and the process, which for a number of years was universal in the trade and is still used by some canneries, succeeded it. For this there are a number of rectangular box vats about 40 by 80 inches and 18 inches in depth, the number varying with the capacity of the cannery. These are usually lined with galvanized metal and provided with a gridiron-shaped iron frame, hung from a windlass or other tackle for lifting or lowering from top to bottom of the vat. The cans are loaded on this gridiron, being placed in an inclined position to allow the draining of the lacquer, and are lowered in the vat sufficiently to submerge them in the lacquer with which the vat is charged to a depth of 7 to 10 inches. The loaded gridiron is then raised to the top of the vat and the cans allowed to drain and dry before piling. This method, while being more effective in regard to the volume of work, was still of necessity a very slow and tedious operation. In damp or rainy weather, especially when it is not possible to open warehouse doors and windows, the gas arising from a number of these vats makes effective drying almost impossible.

Another principal objection to this method of lacquering, which applied also to all earlier attempts, was the impossibility of obtaining an even coat of lacquer when the can was allowed to dry in any stationary position. There was also a large waste by evaporation.

Notwithstanding repeated efforts at invention, however, it was not until 1901 that an effective machine for handling this difficult work was put on the market. The apparatus now in use by a number of canneries receives the cans on a revolving wheel fitted with rests for holding them while passing through the lacquer bath. From here they roll upon an endless chain which revolves the cans as they pass through a long box in which a hot blast dries them before they reach the end of the machine. The rotating or rolling motion given to the can after the lacquer bath, preventing the lacquer from draining to and consequently accumulating on any part of its surface, also has the effect of distributing the lacquer evenly and results in a clean and neatly finished can. The air blast facilitates the work of drying to such an extent that it requires only about two minutes after being deposited on the drying bed of the machine for the cans to be ready for handling, while the quantity of cans which can be handled in a day is vastly greater than by the old method.

A few flat and oval cans are not lacquered, but are protected from rust by wrapping in tissue paper, over which the label is placed.

LABELING.

While machines have been made for this purpose, and many of them are in use, the work is frequently done by hand. A number of men or women seat themselves about 4 feet apart in front of the pile of cans. Each man has in front of him a package of several hundred labels, and by bunching them on a slant so that successive margins protrude beyond each preceding, he can apply paste to the entire number with one stroke of the brush. A can is placed on the label, is quickly rolled, and the label is on much quicker than one can tell it. Each man places to his right the cans he labels, forming a pile of length and width equal to his unlabeled pile, and when the entire lot has been labeled it has been shifted only about 4 feet. Cans of fancy brands of salmon put up on the Columbia River and in the Puget Sound region are wrapped in colored tissue paper before the label is put on. Cartons similar to those used by the sardine packers would make good containers for fancy brands and would be much cheaper than the present method.

Several attempts have been made to popularize salmon packed in glass and porcelain jars, and while these have met with some favor, it was not sufficient to warrant a continuance of the practice for any length of time. But few are being so packed at the present time.

BRANDS.

A very important feature of the canning industry is the selection of appropriate brands or labels for the various grades of salmon. Each company has a number of these, which it has acquired either by designing them or by absorbing another company which owned them. A well-known brand has a value in itself and sometimes is a very important asset. A company will sometimes market a considerable part of its product in one section, and here, where the consumer has become familiar with the brand and pleased with the contents of the can, he will ask for and accept no other, despite the fact that the latter might be, and probably is, the equal of the product he has been using.

For many years but few salmon canners appreciated the value of a can label, and it has taken some bitter experiences to drive home to the rest that a properly designed label placed upon good goods and the owner protected in its use by the law, has real value, just as much as boats, nets, buildings, machinery, or the thousand and one material things required to carry on the business.

A free trade definition of a label would be that it is an artistic representation or intellectual production, stamped directly upon an article of manufacture, or upon a slip or piece of paper or other material, to be attached in any manner to manufactured articles, to bottles, boxes, and packages containing them, to indicate the contents of the package, the name of the manufacturer, or the place of manufacture, the quality and quantity of the goods, directions for use, etc.

Labels are subject to the copyright law and should be registered before use or publication. If not registered, there is no protection in law against infringement. The continued use of a label, however, will give the person so using a certain proprietary right in it, which can be enforced in a court of equity and may be defended by injunctions, which will generally be granted. Such procedings are expensive, annoying to a busy man, and at best will protect one only after at least a certain amount of damage has been done, and it is far safer to avoid this by registering the label at the time of issue, which will give one the further advantage in that a description of the character and quality of the article labeled can be set forth, which will, to a certain extent at least, be protected with the label.

The commercial value of a label and name is represented by the more or less general demand for the goods protected by it. In the canned-salmon industry, as in that of other food-packing industries, certain labels, through the good quality of the goods marketed under them and the publicity created for them, have become of very considerable value to the owners. A case in point is the label Royal Crown, owned by the late R. D. Hume. This was one of the earliest brands marketed in England, and some years later a certain Liverpool firm of salmon handlers paid Mr. Hume the sum of $10,000 for the exclusive right to its use in England.

In designing a label there are several things which should be borne in mind. It should bear an easily remembered name and design; a name difficult of pronunciation should be avoided at all costs. For many years glaring red labels have been popular, but the success met with by those using more subdued and artistic designs and coloring indicates that the public appreciate them more than they do the older and coarser types. The design should be as simple as possible, as experience has demonstrated that a simple form—so simple that it can be fully understood by a mere glance—will gain by regular repetition, while a more complicated design will lose in this process.

A good many now in the business still remember the small label that was used on salmon cans before 1870. Labels about 3 by 5 inches in size, printed in one color, on white or colored newspaper, served merely the purpose of distinguishing cans, telling contents and manufacturer, and were without commercial value. About the year 1870 a few canners commenced to import from the East and Europe full-sized labels, i. e., labels that went all around the can, These were called by some "Pennington" labels, as a firm of that name supplied quite a number of them.

For some years they were used for the best grades only. They were printed in four and five colors, the design showing invariably a number of panels of different shapes and sizes. The lettering was not always plain and sometimes even intentionally irregular and puzzling. The colors were placed side by side, in boldest contrast, without any attempt to harmonize them.

It was soon discovered that the highly colored panels, while striking, lost all effect when massed on the retailer's shelves, and the different brands looked so much alike that the individual designs could not well be remembered by the customer, the only really distinctive feature being the name, and that was generally printed so small and indistinct that it could not readily be seen at a distance.

To remedy these defects, the designers soon reduced the number of panels and subdivisions, increasing meanwhile the size of the remaining ones and filling them with distinctive designs, still colored as simply as before, with no attempt at blending of colors. The background, at first perfectly plain, commenced to show patterns more or less complicated, and at times quite pretentious, so as to take away from the design proper.

Gradually the panel design disappeared. In place of it some showed one continuous picture on the label, which was very unsatisfactory and soon disappeared, as only a fraction of the picture could be seen at one time. Others had two subdivisions, one showing the name of the brand with its illustrations, occasionally used as a trade-mark, the other showing the article packed in the can, both named and illustrated. Unfortunately, these subdivisions were so large that the roundness of the can prevented one from seeing the picture as a whole, but this was soon remedied by making the subdivisions narrower and filling in between with directions, weight of contents, etc.

From this point on the general plan of labels underwent few changes except that the work, both of the artist and pressman, improved wonderfully, some of the labels now designed and printed being real works of art.

Up to a few years ago one of the most serious evils in the trade was the use of misleading and lying brands. The high-grade product would almost invariably be correctly and fully branded, but "chums" and "pinks" were usually branded as "Fresh salmon," "Choice salmon," etc., which would deceive all persons but those well acquainted with the industry. "Do-overs" and very poor fish were usually marketed under a brand which bore the name of a fictitious company or of no company at all.

The passage of State laws of varying degrees of efficiency governing the branding of salmon helped slightly to remedy this condition of affairs, but it was not until the pure food and drugs act, approved June 30, 1906, was put into force by the Government that any radical improvement was noticeable. At the present time but few misleading brands are in use.

BOXING OR CASING.

A case of salmon generally contains 48 one-pound cans or their equivalent, i. e., 24 two-pound cans or 96 half-pound cans. Some canneries pack their half-pound cans in cases of 48. These cases are usually made of wood and cost from 9 to 11 cents each knocked down.

CAN MAKING.

Some of the canneries in the coast States purchase their cans ready-made, but the usual method is to purchase the sheet tin and make up the cans in the canneries. This is especially necessary in Alaska, as it would be impossible to find room on the cannery ships for such a bulk as they would make in addition to the other supplies necessary. Furthermore, the making of cans provides work for a large part of the crew, otherwise unemployed while the rest are getting ready the other necessary paraphernalia. The work is done by machinery and occupies several weeks' time.

CANNING SMOKED SALMON.

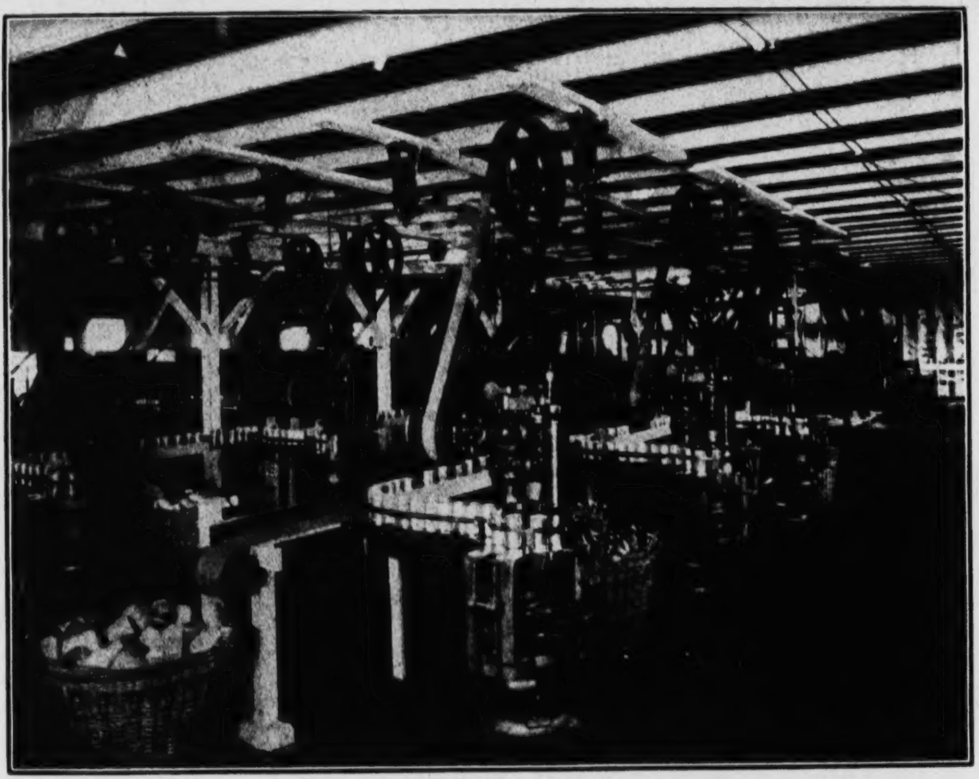
A number of ventures in the line of canning smoked salmon have been made on this coast, but most of the pioneers were not content or able to invest the amount of capital needed and wait the time required to create a demand for such products, and soon quit.

One of the leading British Columbia packers, H. Bell-Irving & Co., some years ago put up in cans some pink salmon which had been treated to an artificial smoke in a vat, and these are said to have made a favorable impression in Australia. Another canner operating on the Fraser River smoked pink salmon, and then, cutting them to the proper length, packed them dry in half-pound cans.

In 1908 the Columbia Canning Co. put up at its cannery on Chilkoot Inlet, Alaska, some smoked salmon which had been shaved into thin strips like dried beef. These, called "Flaxamo," were packed in oil and were very good, especially in making sandwiches.

In 1915 two companies began in Seattle the smoking, slicing, and canning of coho and king salmon. These were put up in oblong flat cans of various sizes, similar to sardine cans, 2½, 4½, and 7½ ounces, respectively, while for a special trade a 7½-pound can was also packed. These fish were cut quite thin, about 40 to 50 slices to the pound, and were packed in hermetically sealed cans with cottonseed oil. The fish were all hard smoked before slicing and canning.

The same companies are also putting up kippered salmon in cans.



MAKING SALMON CANS.

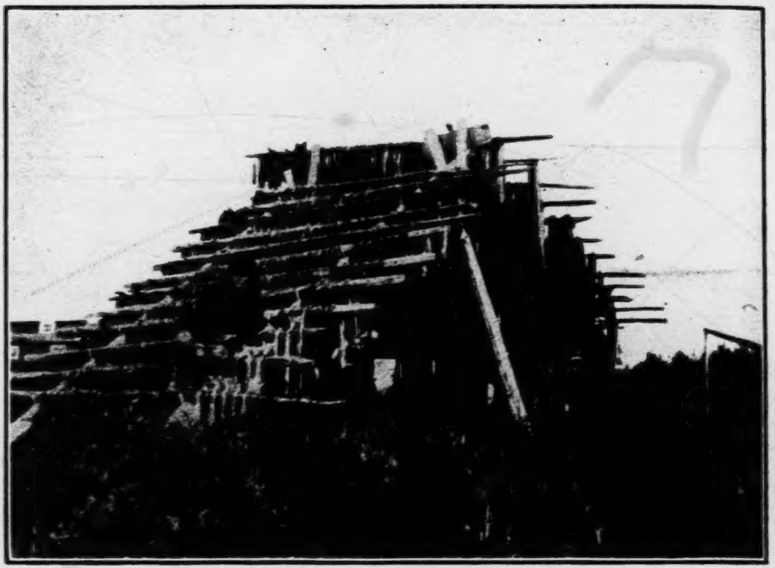


FIG. 1.—AN INDIAN SALMON DRYING RACK, BERING SEA, ALASKA.

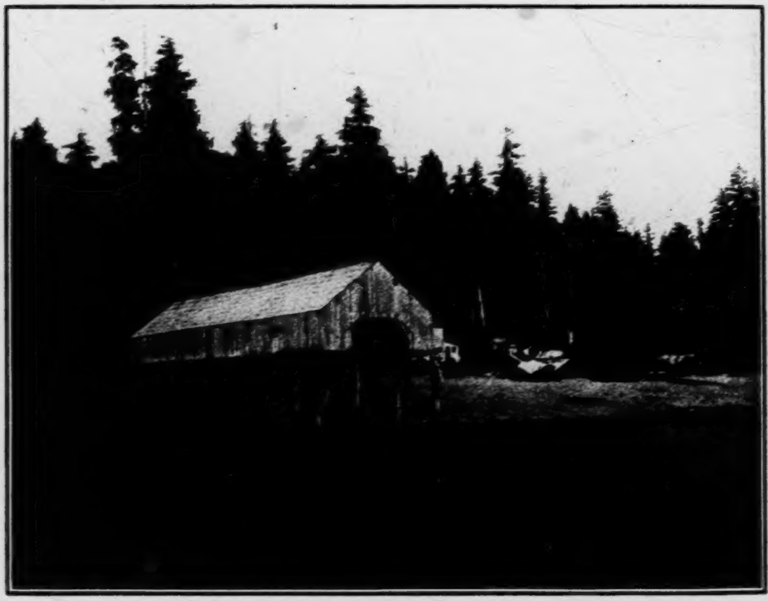


FIG. 2.—THE BARONOVICH SALMON SALTERY; THE OLDEST SALTERY IN ALASKA.

Salmon loaf, made by mixing salmon with flour and various other ingredients, thus producing a paste, is also being canned by several packers.

A straight salmon paste, made solely from the flesh of the salmon, is being manufactured by one of the leading packers.

HOME CANNING.

At a number of places along the coast it has become the custom for the thrifty housewives to do a little home canning of salmon for winter use when the fish are abundant and cheap, and they find canning salmon as easy as canning vegetables and fruit. The fish is dressed, skinned, and the backbone removed. It is then cut into transverse strips of a size to fit either a pint or a quart glass jar, whichever is to be used. The jars are then filled with the pieces, salted to taste, the rubber ring put on, after which the can cover is put on loosely so that the steam may escape. Strips of thin wood are placed at the bottom of a kettle or wash boiler and the cans set down on them. Enough cold water is then poured into the kettle to bring it up to within an inch or two of the top of the cans. The kettle is then put on the stove and, after it comes to a boil, note is made of the time and the cans are cooked from one and one-half to three hours. There seems to be a great variation in the time of cooking on the part of the operators. Some even cook only one hour, but these generally use a preservaline. About two hours seems to be the best time, as the bones are then quite soft. At the end of the cooking period the tops are tightened, the kettle removed from the stove, and the water and cans allowed to cool in the kettle.

MILD CURING.

The beginning of the business of mild-curing salmon, or "sweet pickling," as it is sometimes called, is of comparatively recent date. In 1889 a German dealer came to the Columbia River and tried to interest some of the cannery men in the business. J. O. Hanthorn, M. J. Kinney, and J. W. Cook were persuaded to prepare some, and the plant of the Northwest Cold Storage Co., at Portland, was used to keep the fish at a low temperature during repacking and preparation for shipment. These fish were shipped to Germany, but the shippers received no financial returns, word coming back that the fish were not satisfactory.

Owing to this lack of success from the first effort, no further attempt was made until 1894, when Mueller & Loring, of Chicago, put up a carload of mild-cured salmon at Kalama, Wash., and shipped it to Germany. In 1896 Charles Ruckles and Wallace Bros., of Kalama, packed several carloads for the German market. It was not until 1898 that the business was permanently established on the Columbia, the Trescott Packing Co. and S. Schmidt & Sons putting up plants at Warrenton and Astoria, respectively.

In 1900 the Trescott Packing Co. began packing the spring and fall runs, and the Sacramento River Packers' Association packed the fall run on the Sacramento River, the business being carried on here every year since.

In 1901 the Sacramento River Packers' Association began at Monterey the mild curing of the spring salmon that were taken with hook and line in the open ocean.

S. Ellmore & Co. started the industry in 1902 at Tillamook, and the business began on Puget Sound in 1901, when the San Juan Fishing & Packing Co. and the Seattle Fish Co. took it up. The Pacific Cold Storage Co. began the next year at Anacortes.

Prior to 1906 several of the Alaska cannery men put up each season a few tierces of mild-cured salmon, but it was not until this time that the industry really began as such. In that year J. Lindenberger (Inc.) started packing at Ketchikan, Alaska. The following year several other plants were started, and in 1910 almost all of the king salmon taken in southeast Alaska were mild cured.

In mild curing the fish are split down the middle, the head, tail, and all fins except the pectorals removed, and the backbone cut out. The fish is then in two halves. Each of these halves, or sections, is then scored on the outside eight or nine times with the knife. They are then thrown into a cleaning vat, and here the inner side of each section is carefully scraped clear of blood and membrane with a knife, while the outside is thoroughly cleaned with a scrubbing brush. The sections are then laid carefully inner side up in another vat partly filled with clear, cold, running water, or into a tierce partly filled with fresh water and cracked ice, in which they remain for an hour. Formerly the fish were put into brine, but it has been found that ice water answers the purpose much better. After being thoroughly cooled, the sections are salted down in the tierces, each one being laid with its tail toward the center. Usually about 50 whole fish are required to fill a tierce. The pickle is made to a strength of 90° and should be strained before putting in the tierces. The tierces are then put in a cold storage chamber with a temperature of 35 to 38° F. They are held here from 14 to 21 days, care being taken to keep them full of pickle, which can be added through the hole in the head. The fish shrinks about 30 per cent during curing. After curing fish are taken from the tierces, the salt and slime are carefully removed and the fish repacked in the tierces without salt. When full of fish ice cold pickle with strength of 90° is added, the tierces tested to see if they are air-tight, and then taken back to the cold storage to await shipment.

In the early days of the industry different preparations, which included salicylic and boracic acids, were used to help preserve the fish. This caused much complaint from the Germans, and finally their Government subjected our product to a rigid inspection, with most salutary results, as now it is one of the purest and best products put up on this coast, the use of acids being done away with entirely.

The king salmon is almost invariably the species mild cured, being the only one large enough to answer the requirements of the trade. In 1907 a Ketchikan, Alaska, packer put up a quantity of coho, dog, and humpback salmon, but he found so much difficulty in disposing of the product that he abandoned further efforts in this line. A few cohos are put up each year.

The principal consumers of the mild-cured salmon are the smokers, who take them from the tierce, wash and soak them for a few minutes, and then have a practically fresh fish to smoke, and not, as in the days when hard-pickled salmon were used, one that had lost most of its oil and flavor through the excessive amount of salt needed to preserve it.

The greater part of the product put up on this coast goes to Europe, Germany being the principal consumer, but considerable quantities are sold in Norway, Sweden, and other countries, while the smokers of the cities east of the Rocky Mountains use large quantities every year.

In Germany, the principal market for mild-cured salmon, nearly all of the fish are smoked. One of the most popular ways of using the smoked salmon is in the making of sandwiches, and probably the greater portion of these are used in the beer halls and the automatic restaurants in that country.

PICKLING.

The earliest method of preserving salmon on the coast was by pickling. At times this industry attained to large proportions, but during the last 10 years it has been declining, largely because the canners are able to pay more for the raw fish than the salters. All species of salmon are pickled, but the most popular is the red salmon.

In dressing salmon for pickling the heads are removed, the fish split along the belly, the cut ending with a downward curve on the tail. The viscera and two-thirds of the backbone are removed, and the blood, gurry, and black stomach membrane scraped away. The fish are then thoroughly scrubbed and washed in cold water. They are next placed in pickling butts with about 15 pounds of salt to every 100 pounds of fish. The fish remain here about one week, when they are removed, rubbed clean with a scrub brush, and repacked in market barrels, one sack of salt being used to every three barrels of 200 pounds each. About 40 to 52 red salmon, 25 to 35 coho salmon, 70 to 80 humpback salmon, 10 to 14 king salmon, and 25 to 30 dog salmon are required in packing a barrel of pickled salmon.

A few salteries also pack "bellies." This product is merely the belly of the fish, which is the fattest portion, and as most of the packers threw away the rest of the fish, thus causing a very large waste of choice food, this method has come under the ban of the law in some of the coast States and in Alaska. As a result, but few "bellies" are packed now, and most of these only when some economic use is made of the remainder. Humpback salmon furnish the major part of the "belly" pack.

DRY SALTING.

During the progress of the Russian-Japanese War the preparation of dry-salted dog salmon became an important industry, but as soon as the Japanese fishermen resumed their former occupations the demand fell off so much that the industry was virtually abandoned in the United States, although a number of Japanese continue it in British Columbia. The fish, after being dressed, were packed in boxes, in salt, these boxes holding about 560 pounds of fish, and were shipped in this condition to Japan.

At a number of places in Alaska the bellies of red and coho salmon are cut out and salted, after which the backs are dried in the sun and, thus cured, are used for fox food at the numerous fox ranches. This product is called "ukalu."

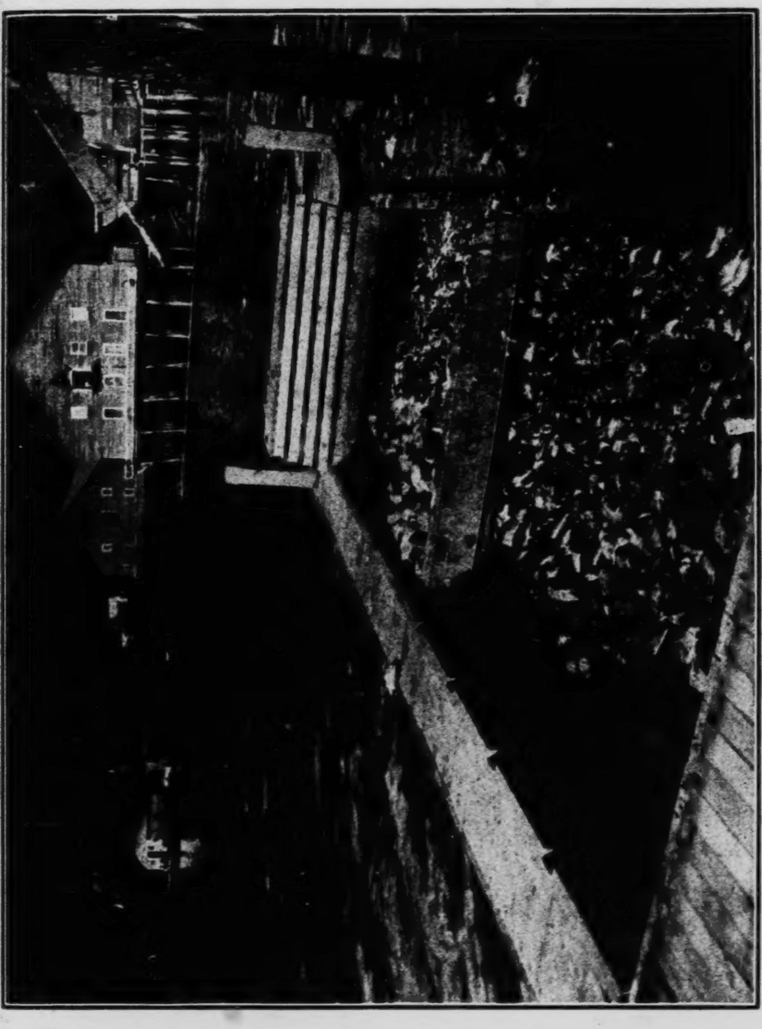
SMOKING.

The smoking of salmon is virtually a continuation of the pickling, as the fish must be pickled before being smoked, the main purpose of the pickling being to preserve them until the time arrives for smoking, which may be weeks or months after the fish are caught. For smoking them the salmon are taken out of the barrel and soaked until as much as possible of the salt is removed. They are then put into the smokehouses and subjected to the heat and smoke of a fairly hot fire for about two days in order that they may be thoroughly dried and hardened. Exposure to a smoldering fire (alder wood is a favorite fuel) for about three days completes the process.

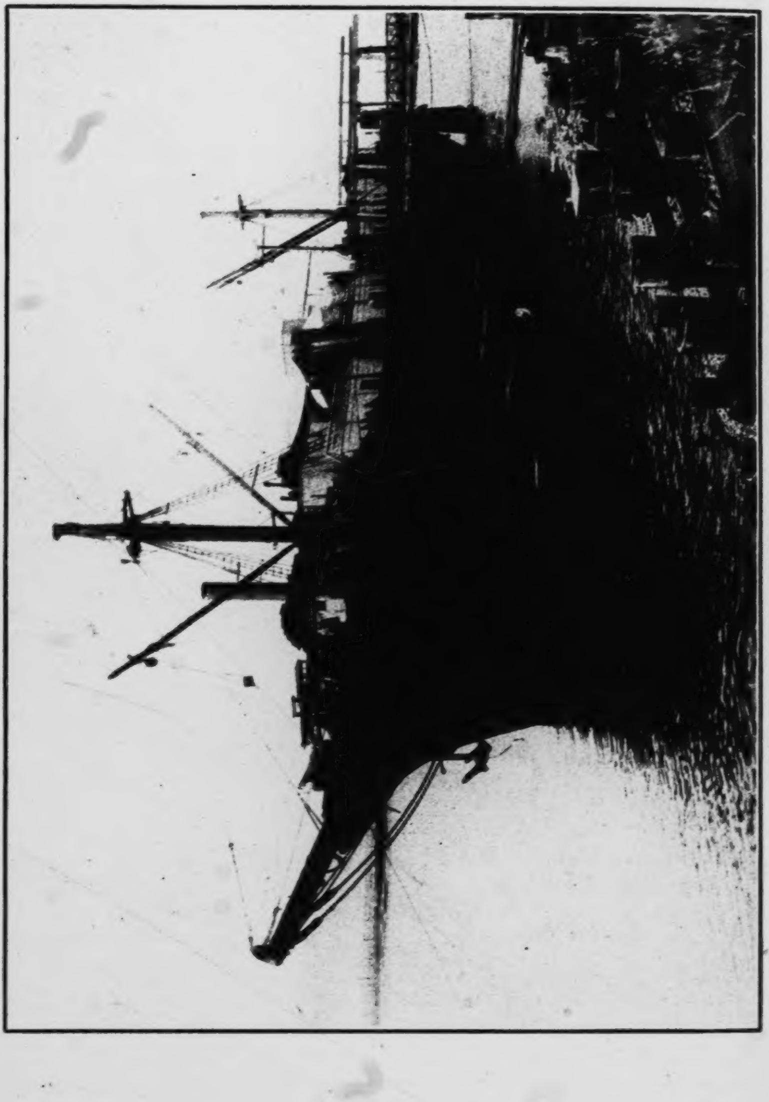
For shipment smoked salmon are packed in wooden boxes, oil paper being placed between the fish.

A variation of the smoking process is known as "kippering." With this method the salmon are dried in a hot fire for about 20 hours and then smoked over another hot fire for about 24 hours. The "buckling" process is also similar to this.

Dog and king salmon are often cut into steaks and kippered. As the sale of white-meated king salmon is somewhat hampered by the whiteness, the smokers use a coloring preparation, known in the



SALMON OFFAL READY FOR DELIVERY TO THE FERTILIZER PLANTS.



SHIP, WM. H. SMITH, FLOATING CANNERY AND COLD-STORAGE PLANT.

trade as Zanzibar carmine. This gives the outside of the fish a deep-colored red gloss, but leaves the inside its natural white color. The steaks, averaging 1 pound each, are wrapped in paper and packed in baskets holding 10 pounds each.

A smoked product, known locally as "beleke," is put up at Kodiak, Alaska, from red and coho salmons. Steelhead trout are the best for this purpose but are not often utilized owing to their scarcity in this region. In preparing "beleke" only the backs of the fish are used, the belly part being cut out and pickled separately. The backs are divided into three grades, according to size, viz, "small," "medium," and "large." They are first put into a brine, the "large" being put in first, followed by the "medium" and "small" at intervals of one hour each, so that all will be cured at about the same time. The coho backs, being the largest, are kept in the brine from 19 to 20 hours, while the red salmon backs, which are smaller, remain in the brine only about 16 hours. After being thoroughly salted the backs are removed from the brine and rinsed in fresh water, then hung in the air for about 24 hours to dry and to allow a thin skin to form on the outside. They are then hung in the smoke-house, in the presence of a little fire of cottonwood or alder. On dry days the gable windows are thrown open and the wind allowed to pass through while the smoking is going on. The smoking must be done slowly, two weeks being devoted to it.

There is a good demand for this product locally, the fish selling for from 15 to 20 cents a pair, but little effort has been made to extend its sale outside of central Alaska.

FREEZING.

The process of preserving fish by freezing was first introduced in 1888. Previous to this the comparatively ancient method of packing with ice, or in rare instances letting the fish freeze naturally during the winter months, was followed. Packing with ice is in quite general use to-day for shipments of fish which are to be preserved for short periods of time. Cooling with ice never results in a temperature lower than 32° F., which, of course, does not freeze the fish.

The freezing of salmon and steelhead trout began on the Sacramento and Columbia Rivers in the late eighties. It was taken up in a small way on Puget Sound in 1892. That year Wallace Bros. and Ainsworth & Dunn froze a small lot, the work being done for them by the Seattle Ice Co. (now the Ice Delivery Co.), and the venture was so successful that the next year nearly all of the wholesale dealers on the Sound took up the business. The Crescent Creamery, of Tacoma, also engaged in the business for the fish dealers for a year or two shortly thereafter. In 1902 the British Columbia Packers' Association bought a large cold-storage plant at New Westminster, British Columbia, at that time the only large and modern plant in the province, and began the active freezing of fish. Since then a number of excellent plants have been built and operated. In Alaska the preparing of frozen salmon began in 1902. The San Juan Fishing & Packing Co., soon to be succeeded by the Pacific Cold Storage Co., put up a cannery and cold-storage plant at Taku Harbor, in southeast Alaska, in 1901, though it did not operate the cold-storage portion until 1902. This is the only plant which was operated in Alaska until the New England Fish Co. erected in 1909 a large plant at Ketchikan for the freezing of halibut primarily, but considerable quantities of salmon have been frozen also.

In 1911 the schooner *Metha Nelson* was fitted up as a floating freezer by the Alaska Packers Association and sent to Kodiak Island. As the vessel arrived in San Francisco shortly before the State's closed season on salmon began, and it was a difficult matter to dispose of the catch before then, the business was abandoned.

In 1912 J. Lindenberger (Inc.) opened a freezing plant at Craig, on Fish Egg Island, Alaska, while the ship *William H. Smith* was outfitted as a floating cannery and freezer by the Weiding & Independent Fisheries Co., at Saginaw Bay, Alaska. The latter operated only one season.

The year 1913 saw quite a development in the industry. The Columbia & Northern Fishing & Packing Co., at Wrangell, the Juneau Cold Storage Co., at Juneau, the Booth Fisheries Co., at Sitka, and the floating cold-storage ship *Glory of the Seas*, by the Glacier Fish Co., at Idaho Inlet, were all started this year.

In 1914 the Ketchikan Cold Storage Co. opened a freezer for the general commercial freezing of fish.

The freezing of salmon is almost invariably carried on in connection with other methods of handling and preserving, and the purpose is usually to secure the fish when numerous and cheap, freeze them, and then hold them until the runs are over and the fish are once more in good demand at high prices. The business proved so profitable, however, that the dealers began to look for wider markets for their product. Europe, more especially Germany, was prospected and a profitable market soon developed, with the result that to-day frozen Pacific salmon can be secured in nearly every town of any size in western Europe, while large quantities are marketed all over our own country.

There are four important features in packing and using frozen salmon: (1) To get fresh fish; (2) to keep them cold (about 15° above zero) after they are frozen; (3) to keep a coat of ice on them; and (4) to allow them to thaw slowly in cold water before cooking.

In selecting salmon for freezing, only the finest and freshest of each species are used. The current belief that freezing destroys the flavor of the fish is erroneous, the flavor depending entirely upon the condition before freezing, and the quicker they are frozen after being caught the better will the natural flavor of the fish be preserved. Frozen salmon are just as wholesome as fresh, and their chemical constituents are almost identical. The danger lies in the temptation to freeze the fish after decomposition has set in, but, fortunately, this is now very rarely practiced in the salmon industry.

The coho, or silver, and the chum, or keta, salmon are the choicest of the salmons for freezing. The other species except the red, or sockeye, which is too oily and rarely frozen, are also frozen in varying quantities. The steelhead trout, which is ranked by the Pacific coast dealers among the salmon, is considered the choicest fish of all for freezing.

Some of the most modern plants in the country are on this coast. These have numerous freezers, generally, in which a temperature of from 25° to 30° F. below zero can be maintained if desired, although a temperature of more than 10° below zero is rarely ever required. All freezing is by direct expansion and each freezer is piped with about 2 feet of 1¼-inch pipe per cubic foot of freezing space. The bunkers in the freezers are in pairs, generally nine pipes wide, spaced 10 inches apart. This leaves about a 3½-foot passage through the center of each freezer opposite the swing doors. The salmon are laid on pans, which are placed on the tiers of pipes.

After freezing, the salmon are passed through openings in the rear of the freezers into the glazing room, which has a temperature of about 20° F., where they are dipped into water, and when removed are covered with a thin glaze of ice, which may be thickened by repeated dippings. This is an extra precaution to exclude the air from the fish.

After being thoroughly frozen and glazed, each fish is covered first with a parchment, like rolls of butter, and then with a piece of heavy brown paper. They are then packed in boxes holding about 250 pounds each, placed in the cold-storage cars and shipped.

UTILIZING SALMON EGGS.

Every year immense quantities of salmon roe are thrown away in the fisheries of the west coast, though there is but little doubt that, if properly prepared, a market could in time be found for this now waste part of the fish. In France there is a good market for a product known as "rogue," which is the spawn of cod, haddock, hake, and pollock salted in casks, and which is used as bait in the sardine fisheries. Salmon spawn is the choicest and most successful bait used on this coast, and if properly prepared would undoubtedly answer the purpose as well as the regular "rogue" if not better, owing to its oiliness and attractive color. The roes should be soaked for some days in old brine and then packed in strong casks holding about 25 gallons each. It might also prove to be a good bait for tolling mackerel on the Atlantic coast.

In 1910 a considerable quantity of salmon roe was prepared in Siberia and sold in competition with caviar, which is prepared from sturgeon eggs. The product met with favor in Europe and now large quantities are prepared each season.

In this country Miss Ida Tuholski, of San Francisco, who had been engaged in the preparation of sturgeon caviar for some years, put up a number of sample lots of salmon caviar which were fully the equal of the best sturgeon caviar. Capital has been chary, however, about engaging in the business, although undoubtedly it will be an important industry some day.

For making caviar the eggs should be as fresh as possible, and in order to make sure of this the salmon, all species, except the sockeye and coho, are utilized in Siberia; the chum eggs make the best caviar. They are taken alive, if possible, shortly after coming from the water, killed and bled, the belly opened up and the roe taken out. This work can best be done on work and living scows anchored close to the fishing camps. The roe is placed upon a stand, the top of which is formed of a small-meshed galvanized-iron wire screen. On the underside is arranged a zinc-lined trough. The operator gently rubs the mass of eggs back and forth over the screen, the mesh of which is just large enough to let the eggs drop through, and, as they are separated from the membrane by the rubbing, they fall through into the trough and are thence drawn off into tubs by means of a sliding door at the end of the trough.

After all the roe has been separated the tub is removed and a certain proportion of salt (the sturgeon caviar makers employ the best Luneburg, Germany, salt in this work, while some of the Siberian makers of salmon caviar use no. 2 Berkshire salt from England) is added to the roe, after which the mass is mixed with the hands. The most delicate part of the whole operation is in the manner of mixing. No direct rule can be given for doing this portion of the work, as the condition of the roe regulates the time consumed and the manner of handling. It requires practical experience to become proficient, but this should be an easy matter for one used to handling salted products. The sturgeon caviar makers use about 11 pounds of salt in preparing a keg of caviar.

After the salt has been added the mass of eggs first dries up, but in a few minutes the strength of the salt draws from the eggs their watery constituents and a copious brine is formed, which can be poured off when the tub becomes too full. In Siberia the caviar makers put the eggs into a brine solution of 19 to 22 per cent Baumé strength immediately after they come from the trough. The salted eggs are then poured into very fine-meshed sieves which hold about 10 pounds each. In the caviar house are arranged long, sloping boards with narrow strips nailed on each side. On these the sieves are placed and left here from 8 to 20 hours in order to thoroughly drain.

The Siberian caviar makers hasten the operation by putting the eggs into a brine solution as noted above, leave them there for from 25 to 45 minutes, then place them in bags and subject them to heavy pressure, after which they are packed. While this method occupies less time, it is not thought the resulting product is as good as that prepared by the slower method outlined above.

The eggs are then transferred to small casks (holding about 135 pounds). The sturgeon caviar makers use oak or pine casks, but some of the Siberian makers say that oak casks turn the salmon caviar black. The casks are steamed before use in order to prevent any possible leakage. It is especially necessary that the kegs or barrels used be air-tight, as otherwise the product will spoil. Barrels such as used in packing salt salmon are rarely ever tight enough to hold caviar. The casks are covered and allowed to stand until the gas escapes and the eggs settle. The vacant space caused by the settling is then filled, the cask headed up and put in a cool place until ready for shipment.

The Siberian salmon caviar makers use a small quantity of "preservaline" in each keg for the purpose of aiding in preserving them, as cold storage facilities are quite primitive as yet in that country, and it is the addition of this powder which forms the mysterious part to the uninitiated. No preservative would be needed in Alaska, however, as the kegs could be shipped in cold storage along with the mild-cured salmon.

Several establishments are putting up these eggs in jars and hermetically sealed cans for use as bait in sport fishing.

MISCELLANEOUS PRODUCTS.

A few years ago a company on the Columbia River put up what was known as "fish pudding." In preparing this the salmon was ground fine, mixed with milk and eggs, and then packed in tin cans. The preparation was soon abandoned.

In 1903 one of the Point Roberts canneries packed a new product which was called "salmon paste." For this the fish was ground up, cooked, seasoned with spices, etc., and made into fish balls, a very palatable dish when warmed over.

In 1905 a Seattle concern began the manufacture of wienerwurst sausages from halibut and salmon.

The Indians in the Bristol Bay region of Alaska occasionally dress the skins of salmon and make of them leather for the tops of boots, also bags and other small articles.

A product, which was first made in Norway, is prepared by means of an invention which quickly dries and pulverizes the flesh of fresh fish. The resulting powder, called "fish flour," is easy to transport from one place to another and has great nutritive value. It is probable that the tailpieces of the fish, which are at present thrown away, and the cheaper grades of salmon might be prepared in this way and thus furnish another market for salmon.[1]

MEAL, FERTILIZER, AND OIL.

As early as 1888 there was a small plant at Astoria, Oreg., where the refuse of the canneries was utilized for the manufacture of oil and fertilizer. In that year 8,000 gallons of oil (chiefly from salmon heads), and 90 tons of fertilizer were prepared. The oil was worth 22½ cents per gallon and the fertilizer had a market value of $20 per ton. Most of the refuse was dumped into the river, however. In 1898 a similar plant was established in the Puget Sound district of Washington. At present the plants of the Robinson Fisheries Co. and Marani Products Co., at Anacortes; the Pacific American Fisheries at Eliza Island, near Bellingham; the Pacific Products Co. at Port Townsend, and the Japanese-American Fertilizer Co. on Lummi Island, all on Puget Sound, operate quite largely on the offal from the Sound salmon canneries.

In 1882 the Alaska Oil & Guano Co. established a fertilizer plant at Killisnoo, Alaska, for the extraction of oil and fertilizer from herring, and has operated the plant continuously ever since. In some years large quantities of whole salmon have been handled at this plant, and the resulting product was found to sell as well as that from herring.

In Alaska the Fish Canners By-Products (Ltd.), in 1914 built a large plant at Ward Cove, near Ketchikan, where salmon offal is used in the preparation of fertilizer, meal, and oil. The company is now experimenting in the preparation of various chemical products from the raw material.

Probably the most serious evil in the salmon industry to-day is the enormous wastage which annually occurs. Over one-fourth of the total weight of each fish handled at the various packing plants is thrown away. With the exception of the tailpiece, which is discarded at some canneries owing to the excessive amount of bone which would be in the product if canned, this waste material could not be utilized as food, comprising as it does the head, viscera, fins, and tail. When not conveniently near the very few fertilizer plants at present in operation this product is either allowed to pass through chutes into the water under the cannery, or is dumped into scows and towed to the ocean or the deeper waters of the sounds, and there thrown overboard. This procedure is not only exceedingly wasteful, but is also far from beneficial to the waters where deposited.

The great desideratum in the salmon fisheries of the Pacific coast at the present time is the invention of a small odorless fertilizer plant, costing not more than $2,500 or $3,000, which can be installed at the various salmon canneries and salteries. The offal from the cannery could there be utilized and the product obtained would doubtless net a fair return on such an investment, while at the same time the present (in the aggregate) enormous waste would be stopped, and the waters adjacent to the canneries rendered far more agreeable to the fishes as well as to the people on shore. It is absolutely essential that the plant shall be odorless, as the smell of the ordinary fertilizer establishment would be very offensive to persons visiting the cannery and would not enhance the demand for canned salmon. At the present time the cheapest plant available costs about $10,000, and very few canneries can afford to invest this sum of money in the disposal of their own offal alone.

A recent issue (1915) of Fertilizers, of London, England, has the following to say upon this subject:

> Investigations conducted at the Agricultural Experiment Station at Harleshausen (Germany) go to show that, provided it is of good quality, fish meal forms a suitable supplementary feeding stuff for farm animals, especially for pigs. Unfortunately, however, it is made in cases from inferior products, such as decomposing fish and herring meal containing excessive quantities of salt, or it may be adulterated with bone meal and carcass meal. Fish meals made from low-grade material may have a harmful effect on the health of the animals to which they are fed. The German report goes on to say that fish meal is commonly produced partly from fish offal and partly from whole fish condemned as unfit for human consumption, or which is unsalable owing to an excessive supply. Purchasers are warned that great care is necessary in buying fish meal, as, apart from the varied nature of the raw material from which it is made, the methods of preparation may produce wide differences in its composition. From the analyses of a large number of different samples of fish meal the proportion of different constituents was found to vary between the following limits:
>
> Water 5.90 to 18.91 per cent; crude protein, 38.83 to 58.96 per cent; digestible protein, 30.43 to 54.52 per cent; fat, 1.55 to 14.03 per cent; phosphate of lime, 7.80 to 36.16 per cent; salt, 0.70 to 20.10 per cent; ash, 20.53 to 45.07 per cent; sand, 0.10 to 6.05 per cent.
>
> Its richness in protein renders fish meal especially suitable for combination with foods, such as roots and potatoes, which possess a low percentage of that constituent. If fed in too large quantities or containing too high a percentage of oil the meal is liable to give a fishy taste to the meat product. It has been commonly accepted that high-grade fish meal should not contain more than 2 to 3 per cent of fat, but when the proportion of meal used in the ration is not too high it is considered (says the report) that there is no objection to using meals containing up to 4 per cent. Among the mineral constituents contained in fish meal are phosphate of lime and salt, both of which are indispensable in the feeding of animals. In the case of salt, however, an excessive amount is valueless, and may even cause illness. For this reason the proportion of salt contained in fish meal should not exceed 3 per cent. The quantity of fish meal which may be fed with advantage to the different kinds of farm stock varies according to the class of stock and to the quality of the meal. It is suggested that the following amounts may be given daily if the meal is of good quality: Cattle, 2 pounds for every

1,000 pounds live weight; pigs, one-fourth to one-half pound per head according to weight; and sheep, one-tenth to one-fifth pound for every 100 pounds live weight.

A great impetus has been given to the industry during the last two years, owing to the big demand which has come from the farmers and poultrymen for fish meal or scrap, which, after it has been mixed with other ingredients, can be fed to cattle, hogs, and poultry. Experiments carried out at various agricultural experiment stations, both here and in Europe, show conclusively that this class of food increases the appetite of the animal, and consequently the weight, while it does not affect the flavor of the flesh of the animals.

SHIPPING SALMON DIRECT TO CONSUMER.

An important new feature in the salmon industry is the shipping of individual salmon direct to consumers by express, or, for certain short distances, by parcel post, for a certain fixed sum, which includes the fish itself and the cost of delivering same to the buyer.

This business began in Tacoma, Wash., in 1914, and those who originated it advertised throughout the country that they would ship a fresh salmon to any express office in the United States (except Southern Express), express prepaid, for $1.25, weight 7 to 8 pounds. In 1915 the cost, delivered east of the Mississippi River, was raised to $1.50 each, the old rate of $1.25 still being in force for shipments west of the Mississippi River. The number of shippers has increased very much, and the business is now carried on from a number of places in Washington, Oregon, and California.

In shipping an individual fish, it is packed in a box containing 20 pounds of cracked ice. These boxes are collected by the express companies and are generally sent out in their own regular cars attached to trains leaving in the evening. About every 15 to 20 hours the box is opened and from 5 to 7 pounds, depending upon the weather, of cracked ice added to the box to make up the loss through melting.

As the Post Office Department will not accept packages in which ice is used for preserving fish, the use of the parcel post for shipments of individual fish is limited to the first postal zone (up to 50 miles from the initial point), except in winter, when the postmasters are authorized, in their discretion, to accept shipments for the second zone (50 to 100 miles from the initial point). In making fresh fish shipments by parcel post, frozen fish are generally used.

Most of the orders come from the Middle West, where fresh fish are not abundant, but orders are received from all sections of the country.

The success met with in shipping fresh salmon led to a considerable expansion of the industry, with the result that now one can obtain not only a fresh salmon, but also may purchase salt, smoked, and kippered salmon, salt codfish, and fresh halibut, smelt, crabs, and other sea food in its season.

VIII. NUTRITIVE QUALITIES OF SALMON.

More and more attention is being paid by the consuming public to the nutritive qualities of the food products offered them, and this is especially true as regards fishery products.

The proper functions of food are two-fold, first, to furnish protein for building and repairing the body, and second, to supply energy for heat and muscular work. Foods which supply an abundance of both at a reasonable price are of the greatest importance from an economical standpoint.

Despite the great prominence of the salmon industry, but little time has been devoted to it by the chemist.

Prof. W. O. Atwater was the first American investigator to devote any portion of his energies to the analysis of Pacific salmon. In Farmers Bulletin No. 142, United States Department of Agriculture, he gives the following analysis of canned Pacific coast salmon: Water, 63.5 per cent; protein, 21.8 per cent; fat, 12.1 per cent; ash, 2.6 per cent; fuel value per pound, 915 calories.[a]

C. F. Langworthy, in "Fish as food" (Farmers Bulletin No. 85, United States Department of Agriculture), gives the following analyses of fresh and canned Pacific coast salmon:

Fresh salmon, California (sections): Refuse (bone, skin, etc.), 5.2 per cent; water, 60.3 per cent; protein, 16.5 per cent; fat, 17 per cent; mineral matter, 1 per cent; total nutrients, 34.5 per cent; fuel value per pound, 1,025 calories.

Canned salmon—refuse (bone, skin, etc.), 3.9 per cent; salt, 1 per cent; water, 59.3 per cent; protein, 19.3 per cent; fat, 15.3 per cent; mineral, 1.2 per cent; total nutrients, 35.8 per cent; fuel value per pound, 1,005 calories.

Dr. Harvey W. Wiley gives the following as the composition of a Pacific coast salmon (species not given):[b]

> Fresh—Water, 63.61 per cent; protein, 17.46 per cent; fat, 17.87 per cent; ash, 1.06 per cent. Dry—Protein, 52.31 per cent; fat, 49.05 per cent; ash, 2.92 per cent.

On page 137 of the same work Dr. Wiley gives the following as the mean of three samples of Pacific coast canned salmon:

> Composition of canned salmon.—Mean of three samples. Water-free substance: Protein, 53.52 per cent; fat, 40.52 per cent; ash, 6.24 per cent.

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[a] The unit used to show the fuel value is the "calorie," and is the amount of heat which would raise the temperature of about 1 pound of water 4° Fahrenheit.

[b] Foods and their adulteration, etc. By Harvey W. Wiley, p. 125. (8 vo., Phila., 1907.)

Prof. Knisely,[a] of the Oregon State Agricultural College at Corvallis, Oreg., analyzed canned salmon packed at the Funter Bay (Alaska) cannery of the Thlinket Packing Co., with the following results:

Species.	Moisture.	Protein.	Fat.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Sockeye, or red	64.74	24.19	8.11	2.06
Coho, or medium red	68.22	26.56	3.61	1.66
Hum pback, or pink	69.43	24.00	4.86	1.68
Keta, or chum	67.06	25.06	6.59	1.26

H. M. Loomis, chief of the Seattle food and drug inspection laboratory, Bureau of Chemistry, United States Department of Agriculture, reports as follows on analyses of both canned and fresh Pacific salmon made at this laboratory.[b]

CANNED SALMON (1911 PACK).

[Each sample is average of two or more cans. All samples, except no. 2, are old form 1-pound tall cans. No. 2 is ½-pound flat cans.]

Samples.	Water.	Ethyl ether extract.[a]	Protein (Nx6.25).	Total ash.	NaCl.[b]	Ammoniacal nitrogen.	
						Richardson method.	Alcohol vapor method.
	Per ct.	*Per cent.*	*Per cent.*	*Per ct.*	*Per cent.*	*Per cent.*	*Per cent.*
No. 1. Puget Sound sockeye	62.44	15.17	20.25	2.50	0.79	0.0403	0.0348
No. 2. Puget Sound sockeye	61.84	13.74	21.77	2.73	1.10	.0437	.0410
No. 3. Alaska medium red	69.97	7.81	20.40	2.58	1.09	.04965	......?...
No. 4. Alaska chum	73.48	2.88	21.33	2.57	.83	.0563	.0557
No. 5. Alaska pink or humpback	74.12	4.75	19.75	1.98	.50	.0404	....
No. 6. Alaska red	70.88	5.26	21.79	2.35	.64	.0455	....

[a] Represents the fat.

[b] Represents the salt.

ANALYSES OF FRESH SALMON, EDIBLE PORTIONS.

Samples.	Water.	Ethyl ether extract.	Protein (Nx6.25).	Total ash.	NaCl.	Ammoniacal nitrogen.	
						Richardson method.	Alcohol vapor method.
	Per ct.	*Per cent.*	*Per cent.*	*Per ct.*	*Per cent.*	*Per cent.*	*Per cent.*
Puget Sound sockeye salmon (caught May 7, 1912)	67.48	8.86	22.24	1.36	....	0.0121	0.0305
Puget Sound steelhead or salmon trout (caught May 7, 1912)	67.89	9.30	21.80	1.25	....	.0135	.0218

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[a] Pacific Fisherman, vol. VI, no. 1, January, 1906, p. 21.

[b] Eighth International Congress of Applied Chemistry, vol. XVIII, p. 239-245.

IX. THE SALMON OUTPUT IN 1915.

STATISTICS OF THE CATCH.

The following tables show, by sections and species, and also by waters for Alaska, Washington, Oregon, and California, the catch of salmon and steelhead trout in American territory on the Pacific coast in 1915, and show their value to the fisherman. Part of these data were obtained from the various State fish commissions and from the United States Bureau of Fisheries.

CATCH OF SALMON IN 1915,[a] BY STATES AND SPECIES.

Species.	Alaska.		Washington.		Oregon.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Coho, or silver	7,989,504	$133,159	10,720,401	$382,148	4,596,252	$150,456
Chum, or keta	38,556,064	225,123	14,180,872	264,592	2,079,911	32,499
Humpback, or pink	123,585,576	634,941	29,644,561	222,331		
King, spring, or chinook	13,440,834	362,184	19,884,530	902,575	23,539,866	1,382,148
Sockeye, red, or blueback	129,394,055	2,729,677	5,187,130	532,384	265,466	13,274
Steelhead trout			2,023,979	121,635	2,341,858	140,511
Total	312,966,033	4,074,984	81,641,473	2,425,655	32,823,353	1,718,888

Species.	California.		Total.	
	Pounds.	Value.	Pounds.	Value.
Coho, or silver	296,719	$14,836	23,602,876	$680,599
Chum, or keta			54,816,847	522,214
Humpback, or pink			153,230,137	847,272
King, spring, or chinook	8,212,506	410,625	65,077,736	3,057,532
Sockeye, red, or blueback			134,846,651	3,275,225
Steelhead trout	33,206	1,992	4,399,043	264,138
Total	8,542,431	427,453	435,973,290	8,646,980

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[a] The published report of the Dominion of Canada for 1915 does not show the catch by species; the salmon as landed is reported at 136,939,400 pounds, valued at $5,743,893.

CATCH OF SALMON IN ALASKA WATERS IN 1915, BY APPARATUS AND SPECIES.

Apparatus and species.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Seines:								
Coho, or silver	1,404,228	$33,404	349,494	$5,825			1,753,722	$39,229
Chum, or keta	17,279,232	86,396	1,534,216	11,507	1,458	$819	18,814,906	97,922
Humpback, or pink	46,170,204	230,851	2,879,772	21,598			49,049,976	252,449
King, or spring	251,592	5,718	20,658	469	117,546	2,671	389,796	8,858
Red, or sockeye	4,652,170	120,565	7,755,465	155,109	6,129,190	122,583	18,536,825	417,257
Total	69,757,426	485,934	12,539,605	194,508	6,248,194	125,273	88,545,225	805,715

CATCH OF SALMON IN ALASKA WATERS IN 1915, BY APPARATUS AND SPECIES—Contd.

Apparatus and species.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Gill nets:								
Coho, or silver	1,285,960	$21,431	430,314	$7,172	595,250	$9,923	2,311,524	$38,526
Chum, or keta	388,944	1,945	816	6	4,316,728	37,771	4,706,488	39,722
Humpback, or pink	391,200	1,956	4,536	21	148,000	555	543,736	2,532
King, or spring	1,707,882	38,815	832,194	18,913	3,101,428	70,487	5,641,504	128,215
Red, or sockeye	2,418,410	72,552	5,388,525	107,771	72,809,100	1,456,182	80,616,035	1,636,505
Total	6,192,396	136,699	6,656,385	133,883	80,970,506	1,574,918	93,819,287	1,845,500
Traps:								
Coho, or silver	2,355,792	39,203	936,172	15,036	144,300	2,405	3,436,264	57,604
Chum, or keta	11,335,912	56,880	2,051,608	16,387	1,647,120	14,412	15,034,640	87,679
Humpback, or pink	73,234,128	365,171	757,736	3,789			73,991,864	368,960
King, or spring	503,866	11,461	1,254,594	28,513	615,120	13,983	2,373,580	53,944
Red, or sockeye	7,099,035	212,971	17,216,560	344,311	4,970,090	99,402	29,284,675	656,684
Total	94,528,733	655,536	22,215,670	408,036	7,376,630	130,199	124,141,023	1,225,671
Lines:								
Coho, or silver	467,904	7,800					467,904	7,800
King, or spring	4,990,796	170,140					4,990,796	170,140
Total	5,458,700	177,940					5,458,700	177,940
Dip nets:								
King, or spring			45,188	1,027			45,188	1,027
Red, or sockeye			956,550	19,131			956,550	19,131
Total			1,001,738	20,158			1,001,738	20,158
Total:								
Coho, or silver	5,513,874	91,898	1,735,980	28,933	739,650	12,328	7,989,504	133,159
Chum, or keta	29,004,088	145,021	3,586,640	27,900	5,965,336	52,202	38,556,064	225,123
Humpback, or pink	119,795,532	608,978	3,642,044	25,408	148,000	555	123,585,576	634,941
King, or spring	7,454,106	226,124	2,152,634	48,922	3,834,094	87,138	13,440,834	362,184
Red, or sockeye	14,169,615	425,088	31,316,100	626,322	83,908,340	1,678,167	129,394,055	2,729,577
Grand total	175,937,215	1,497,109	42,433,398	757,485	94,595,420	1,830,390	312,966,033	4,084,984

CATCH OF SALMON IN WASHINGTON WATERS IN 1915, BY APPARATUS AND SPECIES.

Apparatus and species.	Puget Sound.		Grays Harbor.		Willapa Harbor.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Drag seines:						
Coho, or silver	40,770	$1,699	27,708	$1,154		
Chum, or keta	64,864	1,216	272	5		
Humpback, or pink	9,094	68				
King, or spring	15,498	704	29,590	1,345		
Steelhead trout	730	44				
Total	130,956	3,731	57,570	2,504		
Purse seines:						
Coho, or silver	3,106,365	76,408				
Chum, or keta	10,347,648	192,140				
Humpback, or pink	17,444,812	130,626				
King, or spring	224,510	10,205				
Sockeye, red, or blueback	1,223,465	210,112				
Steelhead trout	113,975	6,529				
Total	32,460,775	626,898				
Gill nets:						
Coho, or silver	683,214	26,467	504,420	9,478	22,500	$941
Chum, or keta	774,416	14,520	425,592	6,684	13,808	257
Humpback, or pink	142,932	1,080				
King, or spring	510,114	28,187	340,940	14,216	139,758	6,354
Sockeye, red, or blueback	99,250	5,933	1,448,815	86,935		
Steelhead trout	16,450	987	11,780	707	110	7
Total	2,227,376	77,174	2,731,547	118,020	176,176	7,559

CATCH OF SALMON IN WASHINGTON WATERS IN 1915, BY APPARATUS AND SPECIES—Continued.

Apparatus and species.	Puget Sound.		Grays Harbor.		Willapa Harbor.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Trap nets:						
Coho, or silver	3,825,648	$159,402	272,640	$11,300	160,286	$6,231
Chum, or keta	1,422,112	26,665	145,096	2,720	92,744	1,758
Humpback, or pink	11,630,852	87,234			1,565	16
King, or spring	5,221,106	237,228	405,196	18,418	250,812	15,946
Sockeye, red, or blueback	2,091,650	197,280				
Steelhead trout	144,230	5,654	12,660	750		
Total	24,335,598	716,517	835,542	33,257	505,407	23,951
Reef nets:						
Coho, or silver	22,584	941				
Chum, or keta	8,944	168				
Humpback, or pink	92,962	697				
King, or spring	5,016	228				
Sockeye, red, or blueback	6,790	611				
Steelhead trout	2,500	150				
Total	138,796	2,795				
Set nets:						
Coho, or silver	411,372	17,140	121,170	5,047	35,856	1,404
Chum, or keta	170,940	3,308	124,336	2,331	100,706	1,999
Humpback, or pink	152,120	1,141				
King, or spring	131,186	5,963	158,664	7,212	104,798	4,713
Sockeye, red, or blueback	16,865	1,518	250	25	4,145	373
Steelhead trout	6,480	389	1,730	104	80	2
Total	888,963	29,459	406,150	14,719	245,585	8,491
Bag nets:						
Coho, or silver	3,600	150				
Humpback, or pink	2,100	16				
Total	5,700	166				
Lines:						
Coho, or silver	490,000	20,000				
King, or chinook	3,090,000	140,000				
Total	3,580,000	160,000				
Grand total:						
Coho, or silver	8,573,553	304,265	925,928	27,041	205,704	8,666
Chum, or keta	12,699,824	287,912	686,206	11,740	206,200	3,904
Humpback, or pink	20,476,862	221,082			1,565	16
King, or spring	9,187,420	417,610	994,296	41,191	596,398	27,053
Sockeye, red, or blueback	3,486,030	418,438	1,440,085	86,958	4,145	373
Steelhead trout	284,355	17,053	26,160	1,570	140	9
Total	63,048,094	1,616,225	4,020,909	168,500	1,013,156	40,021

Apparatus and species.	Columbia River.		Total.	
	Pounds.	Value.	Pounds.	Value.
Drag seines:				
Coho, or silver	40,308	$1,681	108,816	$4,534
Chum, or keta	5,224	98	70,800	1,319
Humpback, or pink	148	1	6,222	69
King, or spring	1,017,456	46,248	1,022,534	46,267
Sockeye, red, or blueback	60,850	3,474	60,820	3,474
Steelhead trout	226,390	16,363	237,130	16,407
Total	1,350,376	67,865	1,548,682	74,100
Purse seines:				
Coho, or silver	82,524	3,426	3,188,889	79,999
Chum, or keta	136,584	2,617	10,207,233	194,737
Humpback, or pink	141,400	1,061	17,686,712	121,967
King, or spring	56,000	2,604	293,110	12,899
Sockeye, red, or blueback	3,895	350	1,227,360	210,468
Steelhead trout	174,480	10,499	286,455	17,308
Total	595,453	20,567	32,891,258	647,165

CATCH OF SALMON IN WASHINGTON WATERS IN 1915, BY APPARATUS AND SPECIES—Continued.

Apparatus and species.	Columbia River.		Total.	
	Pounds.	Value.	Pounds.	Value.
Gill nets:				
Coho, or silver	74,724	83,114	1,284,948	142,089
Chum, or keta	231,909	4,349	1,445,056	25,310
Humpback, or pink	4,986	37	145,928	1,117
King, or spring	3,474,409	157,941	4,465,344	201,048
Sockeye, red, or blueback	24,085	2,166	1,672,120	98,034
Steelhead trout	368,896	22,134	297,732	23,026
Total	4,179,009	269,741	9,314,128	392,404
Trap nets:				
Coho, or silver	722,844	30,118	4,971,280	207,141
Chum, or keta	207,980	3,900	1,808,904	25,042
Humpback, or pink	18,840	141	11,651,286	87,261
King, or spring	4,098,224	182,192	9,985,328	463,579
Sockeye, red, or blueback	80,946	8,095	2,161,586	206,344
Steelhead trout	801,202	53,476	1,046,082	62,080
Total	5,930,047	277,922	31,708,604	1,051,677
Reef nets:				
Coho, or silver	....	....	22,384	941
Chum, or keta	....	....	3,944	168
Humpback, or pink	....	....	92,152	667
King, or spring	....	....	1,016	228
Sockeye, red, or blueback	....	....	6,790	611
Steelhead trout	....	....	2,500	150
Total	....	....	128,786	2,765
Set nets:				
Coho, or silver	1,776	77	470,174	23,730
Chum, or keta	3,839	72	399,776	7,405
Humpback, or pink	1,725	13	153,862	1,154
King, or spring	40,216	1,828	424,862	19,766
Sockeye, red, or blueback	9,870	888	31,130	2,802
Steelhead trout	11,790	717	30,020	1,212
Total	69,216	3,595	1,600,814	56,159
Bag nets:				
Coho, or silver	....	....	3,600	150
Humpback, or pink	....	....	2,100	16
Total	....	....	5,700	166
Wheels:				
King, or chinook	128,436	5,828	128,436	5,828
Sockeye, red, or blueback	107,305	9,667	107,305	9,667
Steelhead trout	30,560	1,824	30,560	1,824
Total	266,301	17,320	266,301	17,320
Lines:				
Coho, or silver	90,000	3,750	570,000	23,750
King, or spring	440,000	20,000	3,520,000	160,000
Total	530,000	23,750	4,090,000	183,750
Grand total:				
Coho, or silver	1,012,208	42,176	10,720,461	282,146
Chum, or keta	565,882	11,036	14,180,873	204,582
Humpback, or pink	167,116	1,258	20,644,561	222,331
King, chinook, or spring	9,167,324	416,711	19,864,530	902,575
Sockeye, red, or blueback	286,900	26,630	5,187,130	522,394
Steelhead trout	1,712,314	102,988	2,022,979	121,635
Total	12,944,482	600,799	81,641,473	2,426,066

CATCH OF SALMON IN OREGON IN 1915, BY WATERS AND SPECIES.

Species.	Columbia River.		Coastal streams.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Blueback	264,770	$13,239	696	$35	265,466	$13,274
Chum	1,561,237	24,396	518,574	8,103	2,079,811	32,499
Chinook	20,515,436	1,230,926	3,024,430	151,222	23,539,866	1,382,148
Silverside	2,493,650	87,278	2,102,602	63,178	4,596,252	150,456
Steelhead	2,279,302	136,752	62,656	3,759	2,341,958	140,511
Total	27,114,395	1,492,591	5,708,958	226,297	32,823,353	1,718,888

CATCH OF SALMON IN CALIFORNIA IN 1915, BY WATERS AND SPECIES.

Location.	Chinook.		Silvers.		Steelhead.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Eel, Mad, Klamath, and Smith Rivers	1,649,189	$82,460	286,719	$14,336	33,206	$1,992	1,969,114	$98,788
Fort Bragg, Mendocino County	56,347	2,812					56,347	2,812
San Francisco Bay and tributaries	3,471,694	173,581					3,471,694	173,581
Monterey Bay	3,035,446	151,772	10,000	500			3,045,446	152,272
Total	8,212,606	410,625	296,719	14,836	33,206	1,992	8,542,431	427,453

PACK OF CANNED SALMON IN 1915.

The following table shows by sections, species, and styles of can the pack of Pacific coast (exclusive of Siberia and Japan) canned salmon in 1915:

Species, grades, and sizes.	Alaska.	Puget Sound.	Queets River.	Soleduck River.	Quinault River.	Grays Harbor.	Willapa Harbor.	Columbia River.
Coho, or silver:	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
½-pound flat	4,301	28,196			126	2,848		12,757
1-pound flat	2,238	25,765		20	409	4,228		3,351
1-pound tall	120,031	113,822		1,200	853	6,960	4,008	17,198
Total	126,570	166,783		1,220	1,388	14,036	4,008	33,306
Chinook, or king, red:								
Fancy—								
½-pound flat		4,540						146,552
1-pound flat		6,682						181,171
1-pound tall		15,200						17,680
1-pound oval								1,807
Standard—								
½-pound flat	4,111				127	458		22,429
1-pound flat	3,735				23	630	492	16,819
1-pound tall	77,848			205	71	685	2,656	30,237
Total	85,694	26,422		205	221	1,773	3,148	416,695
Chinook, or king, white:								
½-pound flat		1,038			155	169		
1-pound flat				26	88	777		
1-pound tall		936		200	681	1,500		
Total		1,974		226	924	2,446		

Species, grades, and sizes.	Alaska.	Puget Sound.	Queets River.	Sole-duck River.	Qui-nault River.	Grays Harbor.	Wil-lapa Harbor.	Colum-bia River.
	Cases.	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
Chum, or keta:								
½-pound flat	....	1,368	....	....	....	....	....	[illegible]
1-pound flat	317	1,878	....	12	8	37	....	[illegible]
1-pound tall	484,091	408,528	....	180	1,985	22,700	5,686	[illegible]
Total	484,408	411,774	....	192	1,993	22,737	5,686	[illegible]
Humpback, or pink:								
½-pound flat	4,221	26,919	....	....	....	....	....	....
1-pound flat	3,508	11,680	....	....	....	....	....	....
1-pound tall	1,862,644	545,050	....	....	....	....	....	....
Total	1,870,373	583,649	....	....	....	....	....	....
Sockeye, or red:								
2-pound nominals	1,520	....	....	....	....	....	....	....
½-pound flat	53,965	55,411	344	....	19,532	....	....	4,700
1-pound flat	111,695	8,476	200	....	3,085	....	....	....
1-pound tall	1,755,106	697	968	....	355	....	....	700
Total	1,922,286	64,584	1,512	....	22,972	....	....	5,400
Steelhead trout:								
½-pound flat	....	....	....	....	....	....	....	[illegible]
1-pound flat	....	....	....	....	....	....	....	[illegible]
1-pound tall	....	....	....	....	....	....	....	[illegible]
Total	....	....	....	....	....	....	....	[illegible]
Grand total	4,459,341	1,269,256	1,512	2,726	27,407	40,982	12,842	[illegible]

Species, grades, and sizes.	Neha-lem River.	Tilla-mook Bay.	Nes-tucca River.	Siletz River.	Alsea Bay and River.	Sius-law River.	Ump-qua River.	Coos Bay and River.	Co-quille River.
Coho, or silver:	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
½-pound flat	200	....	1,900	1,526	1,640	346	960	1,050	1,366
1-pound flat	....	....	....	....	213	....	....	2,000	....
1-pound tall	1,400	4,949	2,100	1,000	1,600	1,409	3,028	450	3,765
Total	1,600	4,949	4,000	2,526	3,453	1,755	3,988	3,500	5,131
Chinook, or king, red:									
Standard—									
½-pound flat	....	....	....	....	....	....	....	....	1,785
1-pound flat	200	250	190	103	164	....	76	....	....
1-pound tall	600	5,425	....	1,400	1,200	....	1,030	....	494
1-pound oval	....	....	1,481	....	....	....	....	....	....
Total	800	5,675	1,671	1,503	1,364	....	1,106	....	2,279
Chum, or keta: 1-pound tall	500	10,599	460	650	50	....	....	....	5,131
Grand total	2,900	21,223	6,131	4,679	4,867	1,755	5,094	3,500	12,541

Species, grades, and sizes.	Rogue River.	Smith River.	Klamath River.	Sacramento River.	Monterey Bay.	British Columbia.	Total.
Coho, or silver:	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
½-pound flat	....	786	....	....	....	67,612	135,175
1-pound flat	515	....	2,500	....	....	15,521	89,980
1-pound tall	....	290	....	....	....	63,732	247,528
Total	515	1,076	2,500	....	....	146,865	543,391
Chinook, or king, red:							
Fancy—							
½-pound flat	1,643	....	....	....	....	....	174,566
1-pound flat	17,451	....	....	....	....	....	185,314
1-pound tall	....	....	....	....	....	....	22,910
1-pound oval	....	....	....	....	....	....	1,907
Standard—							
½-pound flat	....	1,295	....	....	750	35,310	86,275
1-pound flat	....	....	10,400	5,679	100	1,327	28,178
1-pound tall	....	660	....	500	100	14,492	137,775
½-pound oval	....	....	....	....	....	296	305
1-pound oval	....	....	....	....	....	309	1,880
Total	19,094	1,955	10,400	6,179	950	51,734	698,911
Chinook, or king, white:							
½-pound flat	....	....	....	....	....	289	1,651
1-pound flat	....	....	....	....	....	524	1,415
1-pound tall	....	....	....	....	....	5,557	9,474
Total	....	....	....	....	....	6,370	12,540
Chum, or keta:							
½-pound flat	....	....	....	....	....	....	5,384
1-pound flat	....	....	....	....	....	2,739	14,289
1-pound tall	....	....	....	....	....	79,261	1,093,037
Total	....	....	....	....	....	82,000	1,112,710
Humpback, or pink:							
½-pound flat	....	....	....	....	....	78,072	107,312
1-pound flat	....	....	....	....	....	26,280	41,478
1-pound tall	....	....	....	....	....	264,900	2,672,584
Total	....	....	....	....	....	367,353	2,821,374
Sockeye, or red:							
½-pound oval	....	....	....	....	....	3,737	3,737
1-pound oval	....	....	....	....	....	1,579	1,579
2-pound nominals	....	....	....	....	....	....	1,539
½-pound flat	....	....	....	....	....	335,705	498,086
1-pound flat	....	....	....	....	....	44,225	167,084
1-pound tall	....	....	....	....	....	90,796	1,848,670
Total	....	....	....	....	....	476,042	2,492,985
Steelhead trout:							
½-pound flat	....	....	....	....	....	978	7,814
1-pound flat	....	....	....	....	....	273	9,808
1-pound tall	....	....	....	....	....	1,676	13,028
Total	....	....	....	....	....	2,927	30,650
Grand total	19,609	3,031	12,900	6,179	950	1,133,261	7,651,441

X. STATISTICAL DATA FOR OTHER YEARS.

CANNING INDUSTRY OF PACIFIC COAST FROM 1864 TO 1915.

From the beginning of the canning of salmon on this coast it has been the most important branch of the industry, and the following table shows in condensed form the number of cases packed in each year on the Pacific coast of North America from the beginning of the industry in 1864 to 1915.

As British Columbia is a province of the Dominion of Canada it does not come strictly within the scope of this report, but in order to show the pack of cannêd salmon on the North American shores of the Pacific Ocean, which would be incomplete without that of the province, it has been included also.

PACK OF CANNED SALMON ON THE PACIFIC COAST, BY YEARS AND WATERS.

Years.	Puget Sound.	Coastal streams of Washington.	Grays Harbor.	Willapa Harbor.	Columbia River.	Coastal streams of Oregon.	Smith River, Cal.
	Cases.	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
1866					4,000		
1867					18,000		
1868					28,000		
1869					100,000		
1870					150,000		
1871					200,000		
1872					250,000		
1873					250,000		
1874					350,000		
1875					375,000		
1876					450,000		
1877	5,500				380,000	7,804	
1878	218		5,420		460,000	16,624	4,277
1879	1,300				480,000	8,571	
1880	5,100				530,000	7,772	7,500
1881	8,800				550,000	12,220	
1882	7,900				541,300	19,186	
1883	1,500				629,400	16,156	
1884	5,500				620,000	13,376	5,300
1885	13,000				553,800	9,370	1,550
1886	17,000				448,500	49,147	
1887	22,000				356,000	73,906	
1888	21,975		37,000	22,500	372,477	92,863	2,347
1889	11,674				309,885	98,800	
1890	8,000				435,774	47,000	
1891	20,529		500	8,000	398,953	24,500	
1892	26,426		16,500	14,500	487,338	83,600	
1893	89,774		22,000	16,195	415,876	63,778	2,000
1894	95,400		21,400	15,100	490,100	54,815	2,000
1895	179,967		11,440	22,000	634,696	77,875	2,250
1896	195,684		21,274	24,941	481,697	57,300	
1897	494,026		13,300	29,600	552,721	60,156	
1898	400,300		12,100	21,420	487,944	75,679	
1899	919,611		24,240	21,314	322,774	82,041	
1900	469,450		30,800	26,300	356,772	12,237	
1901	1,380,590		41,500	24,000	390,183	58,618	
1902	581,680		31,800	29,492	317,143	44,236	
1903	478,488			5,800	339,577	54,861	
1904	201,498		27,550	26,400	395,104	96,874	
1905	1,018,641		22,080	14,950	397,273	80,066	
1906	430,602		22,000	14,440	394,898	107,332	
1907	696,080		14,000	13,392	324,171	79,712	
1908	448,705		14,000	20,457	253,341	82,478	
1909	1,632,940		19,787	12,024	274,087	56,169	
1910	567,883		51,130	14,508	391,415	108,617	
1911	1,551,028	18,431	75,941	25,497	543,331	128,152	
1912	416,135	19,914	47,267	28,148	285,686	84,074	
1913	2,583,463	13,128	19,886	12,050	286,479	78,488	
1914	817,254	21,480	32,434	16,837	454,621	186,617	3,000
1915	1,299,206	31,735	40,982	12,842	558,534	80,490	3,032
Total	17,155,556	104,688	676,058	513,387	19,068,590	2,377,778	33,457

PACK OF CANNED SALMON ON THE PACIFIC COAST, BY YEARS AND WATERS—Con.

Years.	Klamath River, Cal.	Eel River, Cal.	Sacramento River.	Alaska.	British Columbia.	Total.
	Cases.	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*[a]
1864			2,000			2,000
1865			2,000			2,000
1866						4,000
1867						18,000
1868						28,000
1869						100,000
1870						150,000
1871						200,000
1872						250,000
1873						250,000
1874			2,500			352,500
1875			3,000			375,000
1876			10,000		7,247	467,247
1877		8,500	21,500		58,387	481,081
1878		10,500	34,017	8,159	89,946	636,191
1879			13,855	12,530	61,093	577,340
1880		6,250	62,000	6,539	61,849	697,010
1881			181,200	8,977	199,576	980,572
1882			200,000	21,745	240,401	1,090,882
1883		15,000	123,000	48,337	163,438	961,881
1884		8,200	81,450	64,886	123,706	907,918
1885		5,750	90,000	83,415	108,517	857,042
1886		12,500	39,300	142,065	152,964	848,976
1887			26,500	206,677	204,083	890,256
1888	4,400		68,075	412,115	184,040	1,217,782
1889			57,300	719,196	417,211	1,614,096
1890			25,065	682,591	411,257	1,600,696
1891			10,258	801,400	314,511	1,578,746
1892	1,047		2,281	474,717	248,721	1,254,082
1893	1,600		23,336	643,654	610,202	1,876,915
1894	1,700		28,463	686,440	492,232	1,887,150
1895	1,600		25,185	626,530	567,682	2,109,848
1896			13,357	966,707	617,782	2,408,812
1897			28,543	909,078	1,027,183	3,126,000
1898			29,731	965,097	492,551	2,484,722
1899	1,600		23,590	1,078,146	765,519	3,267,825
1900			30,304	1,548,139	606,540	3,091,542
1901			17,600	2,016,804	1,247,212	5,186,407
1902	2,500		14,043	2,536,824	627,161	4,194,558
1903			8,200	2,246,210	473,847	3,607,073
1904	3,400		14,407	1,953,756	465,894	3,270,863
1905			2,780	1,894,516	1,167,822	4,607,087
1906				2,219,044	629,460	3,817,778
1907				2,160,873	547,459	3,522,808
1908				2,606,973	566,303	3,962,317
1909	5,633			2,396,477	993,060	5,283,679
1910	8,016	6,000		2,412,054	760,830	4,316,483
1911	7,604	8,400	4,142	2,822,317	948,965	6,145,386
1912	18,000	11,000		4,054,641	996,576	5,961,431
1913	6,376		900	3,739,185	1,353,901	8,093,918
1914	11,000		17,316	4,056,653	1,111,039	6,648,386
1915	12,900		[b]7,120	4,480,916	1,133,381	7,629,987
Total	86,229	80,650	1,382,381	52,782,963	21,270,618	115,031,987

[a] Reduced to a common basis of forty-eight 1-pound cans to the case.
[b] Includes 950 cases packed at Monterey.

CANNING INDUSTRY, BY SPECIES AND WATERS.

The tables which follow show separately, by waters and as far as possible by species, the salmon canned on the Pacific coast from the beginning of the industry until 1915. It is only within recent years that the published statistics have shown the pack of the different species separately. In the early years of canning the chinook, or quinnat, salmon was used exclusively, the other species not being utilized until the chinook had begun to decrease in abundance, or a demand had arisen for a cheaper product. There is a very great difference in the selling value of the highest and lowest grades, and it is necessary to have complete statistical data now in order intelligently to comprehend the trend of the industry. While every effort has been made to make these tables complete, there are, unfortunately, some gaps which it was found impossible to fill. Such ellipses indicate that either the canneries did not operate or that no data were available for such periods.

Trade names of each species as known in each district, follow:

Districts.	1	2	3	4	5
Alaska	Red	King	Coho Medium red. Silver.	Pink	Chum. Keta.
British Columbia	Sockeye	Spring	Coho	Humpback	Chum.
Puget Sound	do	Tyee, spring.	do	do	Do.
Columbia River	Blueback	Chinook	Silverside	None packed	Do.
Outside rivers	Quinault	Quinnat	do	do	Do.

Although there are only five species of salmon found on the Pacific coast, each bears several common names which are in general use in one or more of the many fishing districts.

PACK OF CANNED SALMON ON PUGET SOUND IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Sockeye.		Medium red, or silver.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1877	1	...	...	...	...	5,000	...
1878	1	...	...	...	...	238	...
1879	1	...	...	...	...	1,300	$5,000
1880	1	...	...	...	...	...	...
1881	1	...	...	...	...	...	...
1882	1	...	...	...	...	...	...
1883	1	...	...	...	...	...	...
1884	1	...	...	...	...	...	...
1885	4	...	...	...	...	...	...
1889	2	240	$1,200	...	...	7,180	37,400
1890	1	1,000	5,000	...	...	3,000	15,000
1891	2	362	2,101	5,538	$24,921	5,860	19,365
1892	2	86	473	2,954	11,816	7,208	24,500
1893	3	1,200	6,480	47,852	103,371	11,812	59,000
1894	3	...	...	41,781	188,014	22,418	89,672
1895	7	1,542	7,325	65,143	273,106	30,865	154,218
1896	11	13,495	67,475	72,979	350,299	52,640	264,448
1897	12	9,500	39,045	312,048	1,248,192	91,900	282,133
1898	15	11,200	50,624	252,000	1,058,400	98,600	335,240
1899	19	24,384	103,150	499,646	2,398,354	111,387	418,176
1900	19	22,350	134,100	229,800	1,149,000	128,200	512,800
1901	...	...	...	1,220,000	...	...	...
1902	21	30,049	180,266	372,301	2,047,655	86,817	429,085
1903	22	14,500	72,500	167,211	1,003,266	103,450	413,800
1904	13	14,441	69,352	109,264	688,871	118,127	447,851
1905	24	1,804	9,922	825,453	4,952,718	79,335	337,174
1906	16	8,120	48,886	178,748	1,251,236	94,467	472,435
1907	14	1,814	16,326	93,122	698,416	119,472	476,288
1908	11	95,210	665,470	170,951	1,196,657	128,922	644,922
1909	24	12,019	72,004	1,097,904	6,183,300	143,133	690,446
1910	15	10,004	60,234	248,014	1,673,095	162,755	895,133
1911	21	21,823	172,582	127,760	1,168,145	256,123	1,711,178
1912	21	20,292	101,706	184,680	1,080,173	149,727	781,200
1913	32	1,234	5,247	1,673,099	10,871,178	61,019	298,372
1914	32	27,140	179,892	339,767	2,731,682	158,864	715,966
1915	40	28,496	145,565	64,584	676,750	180,780	902,335

Pack of Canned Salmon on Puget Sound in Specified Years—Continued.

Years.	Canneries operated.	Chum.		Pink.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1877	1			500		5,500	
1878	1					238	
1879	1					1,300	$5,000
1880	1					5,100	
1881	1					8,500	
1882	1					7,900	
1883	1					1,500	
1884	1					5,500	
1885						12,000	
1886						17,000	
1887						22,000	
1888	4					21,975	126,356
1889	2	1,145	$3,435	2,809	$7,584	11,674	49,619
1890	1	4,000	12,000			8,000	32,000
1891	2	3,093	10,825	5,647	15,246	20,529	72,401
1892	2	16,180	56,630			26,426	93,416
1893	3	11,380	31,296	17,530	47,331	89,774	347,587
1894	3	22,152	60,918	9,049	24,432	95,400	363,098
1895	7	38,785	94,741	23,633	62,556	179,988	591,948
1896	11	28,580	73,083			195,664	755,236
1897	12	23,310	64,103	57,208	171,804	494,026	1,806,277
1898	18	38,400	105,600			460,200	1,549,864
1899	19	31,481	86,427	252,753	734,241	919,611	2,710,388
1900	19	89,100	245,025			469,430	1,940,925
1901						1,380,590	
1902	21	93,492	467,400			581,659	3,094,446
1903	22	12,001	30,002	181,326	407,984	478,488	1,927,546
1904	13	49,656	124,254			291,498	1,285,328
1905	24	41,067	102,643	70,992	212,976	1,018,641	5,615,428
1906	16	149,218	708,781			430,602	2,481,238
1907	14	50,219	150,847	433,423	1,300,269	696,080	2,642,146
1908	11	47,607	142,821	6,075	18,225	448,765	2,088,096
1909	24	53,698	128,916	370,993	902,342	1,632,949	7,917,608
1910	15	146,942	514,297	108	388	567,883	3,143,298
1911	21	98,321	301,123	1,046,992	4,302,344	1,551,038	7,745,372
1912	21	60,700	164,193	700	2,185	416,125	2,679,457
1913	32	56,225	124,970	791,886	2,092,401	2,583,463	12,320,108
1914	22	299,477	903,675	1,017	4,615	817,354	4,555,649
1915	40	411,724	1,155,474	593,049	1,795,285	1,269,306	4,675,418

Pack of Canned Salmon on Quinaults River in Specified Years.

Years.	Canneries operated.	Chinook.		Sockeye.		Silverside.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1912	1	750	$4,500	200	$2,080	2,500	$11,500
1913	1	1,062	7,574	220	1,848	1,680	5,712
1914	1	1,175	5,875	200	2,134	1,800	6,966
1915	1			1,512	9,072		

Years.	Canneries operated.	Chum.		Steelhead.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1912	1	1,000	$2,400			4,450	$20,480
1913	1	670	1,461	600	$3,300	4,232	19,895
1914	1	1,020	2,887	500	2,750	4,695	20,612
1915	1					1,512	9,072

CANNED SALMON PACK OF SOLEDUCK RIVER IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook, or black.		Sockeye.		Silverside.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1912	1	414	$2,484	15	$156	940	$4,304
1913	1	236	1,442			1,010	3,588
1914	1	237	1,185			1,420	5,674
1915	1	358	1,940			1,330	6,073

Years.	Canneries operated.	Pink.[a]		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1912	1	103	$288	76	$182	1,548	$7,414
1913	1			28	61	1,274	5,091
1914	1	198	567	103	201	1,958	7,627
1915	1	826	2,478	193	538	2,707	11,029

[a] These are virtually all light-colored chinooks.

PACK OF CANNED SALMON ON QUINAULT RIVER IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Sockeye.		Silverside.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1911[a]	1	5,000	$35,000	2,031	$16,000	6,000	$42,000
1912	2			4,500	40,500	3,916	18,014
1913	1			[b] 22,397	188,135	7,106	24,160
1914	2	51	255	12,074	120,740	1,623	6,281
1915	2	1,144	6,864	22,972	220,980	1,388	6,867

Years.	Canneries operated.	Chum.		Total.	
		Cases.	Value.	Cases.	Value.
1911[a]	1	5,400	$27,000	18,431	$120,000
1912	2	5,500	13,200	13,916	71,714
1913	1			7,506	212,295
1914	2	1,048	2,966	14,796	130,242
1915	2	1,993	5,580	27,497	239,240

[a] Previous to this date the fish were transported to the Aberdeen and Hoquiam canneries and prepared there.

[b] The greater portion of these were brought to Aberdeen and canned.

PACK OF CANNED SALMON ON GRAYS HARBOR IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1878	1							5,450	[illegible]
1879	1								
1886								8,300	
1887								13,700	
1888	4							37,000	213,750
1891	1			500	$1,500			500	1,500
1892	1	4,500	$15,300	9,000	30,750	3,000	$9,415	16,500	55,465
1893	1	4,500	22,500	12,000	48,000	5,500	14,850	22,000	85,350
1894	1	12,300	61,500	4,100	16,400	5,000	13,500	21,400	91,400
1895	1	56	202	8,876	28,430	2,517	6,925	11,449	35,557
1896	2	7,816	36,306	9,278	29,680	4,180	11,495	21,274	77,481
1897	1	3,100	11,741	8,300	23,481	1,900	5,000	13,300	40,222
1898	2	5,100	25,052	4,800	16,320	2,200	6,000	12,100	47,372
1899	1	5,000	21,250	15,740	59,025	3,500	5,750	24,240	86,025
1900	2	6,700	33,500	12,900	51,600	11,200	30,800	30,800	115,900
1901								41,500	
1902	1	4,000	20,000	10,000	45,000	17,500	70,000	31,500	135,000
1904	2	4,320	20,163	14,904	51,354	8,316	21,022	27,540	92,539
1905	2	2,000	9,226	13,000	52,000	7,000	16,260	22,000	77,486
1906	2	2,500	10,000	11,500	45,900	8,000	21,500	22,000	77,400
1907	1	1,000	7,000	9,500	47,500	3,500	11,500	14,000	66,000
1908	1	1,000	7,000	9,500	47,500	3,500	11,500	14,000	66,000
1909	1	5,721	23,819	9,019	35,146	5,047	11,608	[a] 19,787	70,573
1910	3	15,486	93,718	21,768	108,840	13,807	48,524	[b] 51,130	251,082
1911	4	15,773	110,411	28,991	232,837	[c] 31,177	155,985	75,941	499,233
1912	5	9,000	54,380	26,202	120,345	12,085	28,956	47,287	203,681
1913	4	1,263	5,771	5,723	19,458	12,919	28,163	19,905	53,392
1914	4	11,890	68,495	9,165	25,434	11,379	33,203	32,434	127,132
1915	4	4,219	20,089	14,086	61,707	22,787	63,678	40,983	145,474

[a] Also 1,649 cases, valued at $9,651, with sockeyes brought from Puget Sound.
[b] Also 4,350 cases of "Quinault," or sockeye, salmon.
[c] Includes 6,730 cases of humpbacks.

PACK OF CANNED SALMON ON WILLAPA HARBOR IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook or black.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1886								13,600	
1887	4								
1888	3							22,600	$120,375
1891	1			8,000	$24,000			8,000	24,000
1892	1	3,000	$10,260	9,000	30,790	2,500	$7,745	14,500	48,795
1893	1	1,700	9,180	7,895	31,580	6,600	18,150	16,195	58,910
1894	1	2,700	14,580	5,600	22,400	6,800	18,700	15,100	55,680
1895	2	4,636	23,180	13,047	41,150	4,917	13,222	22,600	77,552
1896	2	4,551	22,755	11,940	38,208	8,450	21,338	24,941	82,301
1897	1	8,100	33,201	14,600	44,828	6,900	18,975	29,600	97,004
1898	2	5,865	26,510	9,809	33,351	5,746	15,802	21,420	75,663
1899	3	5,650	25,425	10,675	40,031	4,989	13,720	21,314	79,176
1900	3	6,700	33,500	12,400	49,600	7,200	19,800	26,300	102,900
1901								24,000	
1902	3	5,836	29,186	9,128	41,076	24,528	97,112	39,492	167,374
1903	1	2,300	12,800	2,300	10,755	1,200	3,300	5,800	26,855
1904	2	3,000	12,000	7,400	28,440	16,000	38,700	26,400	79,140
1905	2	4,660	20,925	4,300	17,200	6,000	15,000	14,960	53,125
1906	2	4,000	16,000	5,340	21,360	5,100	13,260	14,440	50,620
1907	2	3,530	15,354	9,228	36,682	684	2,496	13,442	54,532
1908	2	4,017	20,585	5,923	24,693	10,517	35,800	20,457	81,078
1909	1	1,455	5,860	4,822	17,368	5,747	13,163	12,024	36,391
1910	1	3,928	15,077	5,096	25,490	5,490	22,711	14,514	63,278
1911	3	5,717	40,019	9,298	65,086	10,482	52,410	25,497	157,515
1912	3	6,123	36,738	8,030	26,908	9,530	32,879	[a] 28,146	108,126
1913	2	67	400	3,111	10,577	8,872	19,437	12,050	30,414
1914	3	2,924	14,431	7,179	27,749	6,734	19,077	16,837	61,257
1915	2	3,148	19,368	4,008	18,437	5,686	15,931	12,842	53,736

[a] Includes 4,463 cases of humpbacks, valued at $11,601.

PACK OF CANNED SALMON ON THE COLUMBIA RIVER FROM THE INCEPTION OF THE INDUSTRY TO 1915.

Years.	Canneries operated.	Chinook.		Blueback.		Silverside.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1866	1	4,000	$64,000				
1867	1	18,000	288,000				
1868	2	28,000	392,000				
1869		100,000	1,350,000				
1870		150,000	1,800,000				
1871		200,000	2,100,000				
1872		250,000	2,325,000				
1873		250,000	2,250,000				
1874	13	350,000	2,625,000				
1875	13	375,000	2,250,000				
1876		450,000	2,475,000				
1877		380,000	2,052,000				
1878	30	460,000	2,300,000				
1879	30	480,000	2,640,000				
1880	29	530,000	2,650,000				
1881	35	550,000	2,475,000				
1882		541,300	2,600,000				
1883		629,400	3,147,000				
1884		620,400	2,915,000				
1885		553,800	2,500,000				
1886	39	448,500	2,135,000				
1887		356,000	2,124,000				
1888	28	372,477	2,327,951				
1889	21	306,697	1,600,182	17,797	$101,051		
1890	21	335,604	1,948,057	67,345	290,069		
1891	23	363,907	2,088,566	15,482	284,242		
1892	24	344,267	1,996,383	66,547	372,909	4,176	$20,880
1893	24	298,773	1,589,374	30,450	152,295	29,107	116,428
1894	24	351,105	1,896,976	43,814	224,430	42,758	171,032
1895	24	444,900	2,428,658	18,015	96,523	99,601	329,603
1896	24	370,943	1,840,511	16,953	81,518	44,108	141,145
1897	22	432,753	1,804,221	12,972	51,888	60,850	197,762
1898	23	329,566	1,490,394	66,670	300,015	65,431	222,466
1899	17	255,824	1,458,175	28,969	134,723	29,608	112,035
1900	16	262,392	1,531,258	12,103	92,184	44,925	202,163
1901							
1902	14	270,580	1,428,743	17,037	86,466	10,512	44,733
1903	16	301,762	1,610,614	8,383	42,967	12,181	49,888
1904	20	320,378	1,944,600	12,911	78,048	31,254	118,257
1905	10	327,106	1,962,626	7,768	46,606	26,826	114,011
1906	19	311,334	1,868,007	7,816	54,712	41,446	134,338
1907	19	258,433		5,504		31,757	
1908	14	210,006		8,881		31,432	
1909	15	102,131	1,203,646	[a] 27,908	214,861	42,178	185,070
1910	15	244,285	1,882,137	6,234	34,287	68,922	363,668
1911	15	405,862	2,204,185	5,968	47,904	79,416	549,478
1912	15	220,317	1,968,526	8,210	85,384	31,842	177,386
1913	15	192,116	1,664,670	11,152	93,677	40,969	175,412
1914	17	289,464	2,573,503	25,311	376,924	69,760	380,695
1915	10	406,436	3,094,361	5,409	36,707	23,336	173,384
Total.							

[a] Of these, 2,846 cases, valued at $23,208, were packed with sockeyes brought from Puget Sound.

PACK OF CANNED SALMON ON THE COLUMBIA RIVER FROM THE INCEPTION OF THE INDUSTRY TO 1915—Continued.

Years.	Canneries operated.	Chum.		Steelhead trout.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1866	1	....	....	....	....	4,000	$64,000
1867	1	....	....	....	....	18,000	288,000
1868	2	....	....	....	....	28,000	392,000
1869	....	....	....	....	....	100,000	1,350,000
1870	....	....	....	....	....	150,000	1,800,000
1871	....	....	....	....	....	200,000	2,100,000
1872	....	....	....	....	....	250,000	2,325,000
1873	....	....	....	....	....	250,000	2,250,000
1874	13	....	....	....	....	350,000	2,625,000
1875	13	....	....	....	....	375,000	2,250,000
1876	....	....	....	....	....	450,000	2,475,000
1877	....	....	....	....	....	380,000	2,052,000
1878	30	....	....	....	....	460,000	2,300,000
1879	30	....	....	....	....	480,000	2,640,000
1880	29	....	....	....	....	530,000	2,650,000
1881	35	....	....	....	....	550,000	2,475,000
1882	....	....	....	....	....	541,300	2,600,000
1883	....	....	....	....	....	629,400	3,147,000
1884	....	....	....	....	....	620,400	2,915,000
1885	....	....	....	....	....	553,800	2,500,000
1886	39	....	....	....	....	448,500	2,135,000
1887	....	....	....	....	....	356,000	2,124,000
1888	28	....	....	....	....	372,477	2,234,862
1889	21	....	....	25,391	$108,587	309,885	1,859,320
1890	21	....	....	42,825	171,300	435,774	2,407,456
1891	22	....	....	29,564	118,156	398,953	2,440,964
1892	24	....	....	72,348	289,392	487,338	2,679,090
1893	24	2,311	$6,933	65,226	260,904	415,876	2,095,934
1894	24	....	....	52,422	209,688	490,100	2,501,126
1895	24	22,463	62,501	49,678	203,542	634,696	3,110,967
1896	24	....	....	49,663	198,652	481,697	2,361,826
1897	22	....	....	46,146	165,440	552,721	2,219,311
1898	23	....	....	26,277	60,353	487,944	2,073,228
1899	17	11,379	33,836	11,904	39,186	332,774	1,777,975
1900	16	17,696	63,706	20,597	102,985	356,772	2,282,296
1901	....	....	....	....	....	300,153	1,942,680
1902	14	10,401	41,604	8,593	42,965	317,143	1,644,500
1903	16	10,000	37,500	7,251	36,255	339,577	1,777,105
1904	20	20,668	52,601	9,865	48,893	385,104	2,242,678
1905	19	25,751	65,206	9,822	49,110	397,273	2,237,571
1906	19	27,802	69,505	6,500	32,500	394,898	2,149,062
1907	19	22,556	....	5,921	....	324,171	1,763,490
1908	14	16,884	....	10,726	....	253,341	1,380,708
1909	15	24,542	57,116	17,382	99,796	[a] 274,087	1,760,088
1910	15	66,538	232,883	5,436	31,203	391,415	2,544,198
1911	15	53,471	203,198	8,504	47,309	543,331	3,052,164
1912	15	18,699	46,590	6,958	22,106	285,066	2,319,864
1913	15,	13,303	29,486	8,939	49,142	266,479	2,012,387
1914	17	49,285	306,541	10,792	50,356	454,621	3,695,989
1915	19	86,530	251,632	28,723	129,358	558,534	4,305,262
Total	....	....	....	....	....	19,068,830	110,178,619

[a] 55 cases of humpbacks, valued at $132, were also packed with humpbacks brought from Puget Sound.

PACK OF CANNED SALMON ON THE NEHALEM RIVER, OREG., IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1887	1	....	....	....	....	....	....	5,000	$30,000
1889	....	....	....	....	....	....	....	6,000	32,000
1890	....	....	....	....	....	....	....	9,000	45,500
1891	1	....	....	....	....	....	....	3,500	14,000
1892	1	....	....	10,000	$40,000	....	....	10,000	40,000
1893	1	1,692	$6,768	5,031	20,124	....	....	6,723	26,892
1894	1	1,627	6,508	4,866	19,464	....	....	6,493	25,972
1895	1	1,752	7,008	5,152	16,486	....	....	6,904	23,494
1896	1	2,828	8,484	5,218	15,654	....	....	8,046	24,138
1897	2	3,384	10,152	8,366	25,098	....	....	11,750	35,250
1898	1	3,808	9,891	5,700	19,380	....	....	9,508	29,271
1899	1	1,384	5,536	7,405	26,658	1,288	$3,864	10,077	36,058
1900	1	....	....	....	....	....	....	....	....
1901	1	268	1,139	3,273	13,092	2,669	7,206	6,210	21,437
1902	1	271	1,431	3,169	13,468	2,570	10,280	6,010	25,179
1903	1	686	3,670	4,615	19,614	....	....	5,301	22,284
1904	1	500	2,500	5,000	20,000	6,000	12,000	11,500	34,500
1905	1	2,700	16,200	2,900	12,325	6,000	15,000	11,600	43,525
1906	1	3,987	23,922	4,976	14,928	2,057	5,143	11,020	42,993
1907	1	4,000	28,000	6,600	19,800	2,000	6,000	12,600	53,800
1908	1	5,000	35,000	6,100	18,300	2,016	6,048	13,116	59,348
1909	1	1,980	10,542	4,554	20,253	909	2,091	7,443	32,886
1910	1	3,500	24,500	5,400	29,700	1,500	4,500	10,400	58,700
1911	2	5,821	46,568	14,878	81,829	3,439	13,048	24,138	141,445
1912	2	....	....	13,331	73,321	1,571	3,927	14,902	77,248
1913	1	300	1,500	764	3,056	5	11	1,069	4,567
1914	2	4,841	32,887	11,800	63,720	1,668	4,170	18,309	101,777
1915	2	400	2,400	5,400	24,840	2,260	6,328	8,060	33,568

PACK OF CANNED SALMON ON TILLAMOOK BAY, OREG., IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1884	....	....	....	....	....	....	....	4,500	....
1885	....	....	....	....	....	....	....	9,800	....
1886	2	....	....	....	....	....	....	37,000	....
1887	2	....	....	....	....	....	....	21,000	$115,500
1888	2	....	....	....	....	....	....	14,633	84,140
1889	....	....	....	....	....	....	....	9,500	52,250
1890	....	....	....	....	....	....	....	14,009	79,049
1891	1	....	....	....	....	....	....	....	....
1892	1	....	....	18,000	$72,000	....	....	18,000	72,000
1893	1	497	$1,988	4,000	16,000	6,919	$17,297	11,416	35,285
1894	1	700	2,800	7,763	31,052	700	1,750	9,163	35,602
1895	1	....	....	6,514	20,845	7,001	19,253	13,515	40,098
1896	1	2,200	6,600	4,860	14,580	....	....	7,060	21,180
1897	1	2,000	6,000	9,000	27,000	....	....	11,000	33,000
1898	1	5,000	13,000	10,342	35,162	....	....	15,342	48,162
1899	1	2,180	8,720	3,889	14,036	5,121	15,363	11,190	38,119
1900	1	....	....	....	....	....	....	....	....
1901	1	848	4,240	2,133	9,598	3,901	10,728	6,882	24,566
1902	1	215	1,135	2,287	9,720	4,093	16,372	6,595	27,227
1903	1	....	....	2,727	11,590	2,620	10,480	5,347	22,070
1904	1	....	....	4,400	17,600	6,500	13,000	10,900	30,600
1905	1	1,100	6,600	1,700	7,650	8,800	22,000	11,600	36,250
1906	1	1,870	11,220	2,364	7,092	1,270	3,175	5,504	21,487
1907	1	2,000	14,000	3,410	10,230	2,314	6,942	7,724	31,172
1908	1	2,300	16,100	6,000	21,000	4,000	12,000	12,300	49,100
1909	1	2,615	15,063	5,029	21,809	3,712	8,538	11,356	46,010
1910	1	2,900	20,300	4,500	24,750	2,000	6,000	9,400	51,050
1911	2	8,433	67,464	12,663	69,647	5,277	20,053	26,373	157,164
1912	2	3,811	26,677	6,418	32,090	4,550	11,375	14,779	70,142
1913	1	2,600	15,600	1,000	4,000	1,000	2,200	4,600	21,800
1914	2	4,734	33,138	4,131	22,307	6,707	16,867	15,572	72,312
1915	3	5,675	34,300	4,549	20,925	9,099	25,477	19,323	70,702

PACK OF CANNED SALMON ON NESTUGGA RIVER, OREG., IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1887	1	....	....	....	....	....	....	4,300	$23,650
1888	1	....	....	....	....	....	....	5,000	28,750
1889	....	....	....	....	....	....	....	6,700	36,850
1891	1	....	....	....	....	....	....	....	....
1899	1	1,109	$4,436	3,034	$10,922	513	$1,539	4,656	16,897
1900	1	....	....	....	....	....	....	....	....
1904	1	279	1,116	3,553	13,323	396	1,089	4,228	15,528
1905	1	3,000	18,000	1,000	4,250	400	1,000	4,400	23,250
1906	1	2,622	15,732	2,468	7,404	165	413	5,255	23,549
1907	1	2,100	14,700	3,540	10,620	150	450	5,790	25,770
1908	1	2,000	14,000	3,000	10,500	100	300	....	24,800
1910	1	2,000	14,000	3,300	18,150	140	420	5,440	32,570
1911	1	3,562	28,496	7,124	39,182	641	2,436	11,327	70,114
1912	1	3,090	18,540	6,180	30,900	706	1,770	9,976	51,210
1913	1	126	756	243	972	....	....	369	1,728
1914	1	3,542	24,794	5,730	30,942	265	662	9,537	56,398
1915	1	200	1,300	3,930	18,078	800	2,240	4,930	21,618

PACK OF CANNED SALMON ON SILETZ RIVER, OREG., IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1896	1	2,500	$7,500	1,900	$5,700	....	....	4,400	$13,200
1897	1	3,510	10,530	5,015	15,045	....	....	8,525	25,575
1898	1	3,200	8,360	4,330	14,722	....	....	7,530	23,082
1899	1	2,200	9,900	2,319	8,696	200	$550	4,719	10,146
1900	1	....	....	....	....	....	....	....	....
1901	1	876	4,380	3,740	16,830	360	1,260	4,976	22,470
1902	1	600	3,168	1,917	8,147	500	2,000	3,017	13,315
1904	1	1,000	5,000	3,300	13,200	1,000	2,000	5,300	20,200
1905	1	1,500	9,000	1,700	7,225	900	2,250	4,100	18,475
1906	1	2,635	15,810	3,192	9,576	167	418	5,994	25,804
1907	1	2,333	16,331	4,300	12,900	200	600	6,833	29,831
1908	1	2,100	14,700	4,700	16,450	300	900	7,100	32,050
1910	1	2,200	15,400	4,600	25,300	250	750	7,050	41,450
1911	1	3,584	28,672	7,164	39,402	237	901	10,985	68,975
1912	1	3,277	19,662	6,554	32,770	283	707	10,114	53,139
1913	1	15	75	354	1,416	17	37	386	1,528
1914	1	3,356	23,492	6,712	36,245	196	490	10,264	60,227
1915	1	100	600	3,000	13,800	100	280	3,200	14,680

PACK OF CANNED SALMON ON YAQUINA BAY AND RIVER, OREG., IN SPECIFIED YEARS.[a]

Years.	Canneries operated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1887	2	....	....	....	....	....	....	....	....
1888	3	....	....	....	....	....	....	5,068	$29,255
1889	....	....	....	....	....	....	....	5,000	27,500
1891	1	....	....	....	....	....	....	....	....
1896	1	1,714	$5,142	615	$1,845	....	....	2,329	6,987
1898	1	170	442	1,530	5,202	....	....	1,700	5,644
1899	2	316	1,422	3,234	12,127	1,300	$3,575	4,850	17,124
1900	1	....	....	....	....	....	....	....	....
1901	1	96	480	2,848	12,816	549	1,647	3,493	14,943
1903	1	....	....	1,238	5,262	315	787	1,553	6,049
1904	1	50	200	2,600	8,840	450	1,080	3,100	10,120
1905	1	200	1,200	2,050	8,613	62	155	2,312	9,968
1906	1	500	3,000	2,100	9,300	60	150	2,660	12,450
1907	1	834	5,838	1,000	3,000	49	147	1,883	8,985
1908	1	....	....	4,000	14,000			4,000	14,000
1909	1	....	....	1,139	4,556	33	76	1,172	4,632
1910	1	....	....	2,069	12,345	....	....	2,069	12,345
1911	1	....	....	1,009	5,549	51	289	1,060	5,838

[a] Cannery not operated from 1912 to 1915, both years inclusive.

PACK OF CANNED SALMON ON ALSEA RIVER AND BAY, OREG., IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1886	1								
1887	2							11,180	$64,285
1888	3							9,620	55,315
1889								10,000	55,000
1891	1								
1892	1			3,600	$14,400			3,600	14,400
1893	1	1,260	$6,300	3,240	12,960			4,500	19,260
1894	1	440	2,200	4,160	16,640			4,600	18,840
1895	1	1,700	6,375	3,280	11,808			4,980	18,183
1896	1	3,500	10,500	3,400	10,200			6,900	20,700
1897	1	1,800	5,400	3,200	9,600			5,000	15,000
1898	1	4,296	11,170	2,170	7,378			6,466	18,548
1899	1	2,150	9,138	5,010	19,038			7,160	28,176
1900	1								
1901	1	695	3,475	4,629	18,790	891	$3,118	6,215	25,383
1902	1	701	3,702	4,530	19,253	670	2,680	5,901	25,635
1903	1	1,031	5,516	4,242	18,029	44	88	5,317	23,633
1904	1	1,000	5,000	6,500	26,000	300	600	7,800	31,600
1905	1	2,500	15,000	1,800	7,650	700	1,750	5,000	24,400
1906	1	3,702	22,212	3,843	11,529			7,545	33,741
1907	1	800	5,600	5,100	15,300	350	1,050	6,250	21,950
1908	1	1,200	8,400	6,000	21,000	400	1,200	7,600	30,600
1909	1	1,119	6,714	5,486	24,027	80	184	6,685	30,925
1910	1	2,500	17,500	5,900	31,950	100	300	8,500	49,750
1911	2	4,161	33,288	9,329	51,309	688	2,614	14,178	87,211
1912	2	3,731	22,386	8,286	41,430	524	1,310	12,541	65,126
1913	2	1,607	8,035	4,304	17,216	160	352	6,071	25,603
1914	2	4,546	31,822	6,728	36,331	73	183	11,347	68,336
1915	2	1,668	10,763	6,966	32,044	178	498	8,812	43,305

PACK OF CANNED SALMON ON THE SIUSLAW RIVER, OREG., IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1878	2							10,300	$55,620
1879	2								
1886	1							1,500	
1888	1							11,960	68,770
1889	1							12,000	66,000
1891	2								
1892	2			18,000	$72,000			18,000	72,000
1893	2	1,471	$7,355	11,830	47,320			13,301	54,675
1894	2	1,871	9,355	14,987	59,948			16,858	69,303
1895	2	1,637	6,139	10,465	35,274			12,102	41,413
1896	1	2,700	8,100	9,000	27,000			11,700	35,100
1897	1	1,100	3,300	3,900	11,700			5,000	15,000
1898	1	850	2,210	10,000	34,000			10,850	36,210
1899	1	1,162	4,648	7,323	26,363	115	$345	8,600	31,356
1900	2								
1901	1	1,735	8,675	7,488	29,952			9,223	38,627
1902	1	1,288	6,800	4,320	18,200			5,608	25,000
1903	1	1,519	8,127	6,842	29,079			8,361	37,206
1904	1	500	2,500	6,500	26,000			7,000	28,500
1905	1								
1906	2	4,500	27,000	15,000	45,000	1,500	3,750	21,000	75,750
1907	1			15,773	47,319			15,773	47,319
1908	1			8,600	30,100			8,600	30,100
1909	2	632	3,792	7,436	32,956			8,068	36,748
1910	2	856	5,992	12,800	70,400	8,502	25,506	22,158	101,898
1911	2	1,120	8,960	10,266	56,463	5,000	19,000	16,386	84,423
1912	2			6,108	30,540			6,108	30,540
1913	[a]1			4,281	17,124			4,281	17,124
1914	1			9,266	50,036			9,266	50,036
1915	1			1,755	8,073			1,755	8,073

[a] The two canneries combined and operated one plant.

PACK OF CANNED SALMON ON THE UMPQUA RIVER, OREG., IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1878	2							8,100	$42,740
1879	2								
1884	2							3,700	
1885	1							10,500	
1886	1							15,700	
1887	1							4,000	22,000
1888	1							9,000	51,750
1889	1							12,000	66,000
1891	1								
1892	1			10,000	$40,000			10,000	40,000
1893	1	809	$4,045	3,204	12,816			4,013	16,861
1894	1	235	1,175	6,875	27,500			7,110	28,675
1895	1	992	3,720	7,697	28,863			8,689	32,583
1896	1	1,300	3,900	8,000	24,000			9,300	27,900
1899	2	925	3,860	7,576	27,006	115	$345	8,616	31,211
1900	2								
1903	1	23	123	6,733	28,615			6,756	28,738
1904	1	500	2,500	9,500	38,000	500	1,000	10,500	41,500
1905	1	6,100	36,600	10,500	44,625			16,600	81,225
1906	1	1,143	6,858	5,613	16,839			6,756	23,697
1909	1	500	3,000	7,753	31,012			8,253	34,012
1910	1	2,000	14,000	11,000	60,500			13,000	74,500
1911	1	300	2,400	6,118	33,649			6,418	36,049
1912	1	30	210	3,759	18,795			3,789	19,005
1913	1			398	1,990			398	1,990
1914	1	1,000	8,000	2,000	10,000			3,000	18,000
1915	2			5,100	23,460			5,100	23,460

PACK OF CANNED SALMON ON COOS BAY AND RIVER, OREG., IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Silverside.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1887	2					11,300	$62,150
1888	1					5,500	31,625
1889	1					7,000	38,500
1891	2						
1893	1			3,125	$12,500	3,125	12,500
1894	1	163	$815	8,428	33,712	8,591	34,527
1895	1	5,110	19,163	2,332	8,934	7,442	28,097
1896	1	13,000	39,000	2,000	6,000	15,000	45,000
1897	1	6,200	18,600	2,200	6,600	8,400	25,200
1898	2	3,142	8,169	7,180	24,412	10,322	32,581
1899	2	1,273	5,092	5,174	18,626	6,447	23,718
1900	2						
1901	1	1,215	6,075	4,082	16,328	5,297	22,403
1902	1	412	2,175	2,640	11,220	3,052	13,395
1904	1	2,033	7,725	7,200	24,480	9,233	32,205
1905	1	2,043	12,258	1,755	5,265	3,798	17,523
1909	1	275	1,475	3,959	17,927	4,234	19,402
1910	1	500	3,500	5,500	30,250	6,000	33,750
1911	2	2,630	21,040	7,260	39,930	9,890	60,970
1912	2	1,457	10,199	3,989	19,945	5,446	30,144
1913	2			7,383	29,532	7,383	29,532
1914	1			9,300	50,220	9,300	50,220
1915	1			3,500	16,100	3,500	16,100

PACK OF CANNED SALMON ON THE COQUILLE RIVER, OREG., IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Silverside.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1883	1	....	....	....	....	7,090	....
1884	1	....	....	....	....	7,300	....
1885	1	....	....	....	....	3,800	....
1886	2	....	....	....	....	8,300	....
1887	3	....	....	....	....	....	....
1888	2	....	....	....	....	11,000	$63,250
1889	....	....	....	....	....	8,600	47,300
1891	1	....	....	....	....	....	....
1892	1	....	....	5,000	$20,000	5,000	20,000
1893	1	....	....	6,800	26,000	6,800	26,000
1894	[a] 1	....	....	2,000	8,000	2,000	8,000
1895	2	760	$2,887	8,724	32,615	9,484	35,502
1896	2	1,225	3,675	7,800	23,400	9,025	27,075
1898	2	541	1,407	7,495	25,499	8,036	26,906
1899	2	950	3,800	7,550	28,500	8,500	32,300
1900	1	2,636	13,180	9,601	38,404	12,237	51,584
1901	1	133	665	5,096	20,384	5,229	21,049
1902	1	286	1,510	5,877	24,927	6,163	26,437
1903	1	321	1,771	9,095	36,911	9,416	38,682
1904	2	600	2,400	13,688	54,744	14,288	57,144
1905	2	2,100	12,600	11,343	48,208	13,443	60,808
1906	2	821	4,926	17,979	53,937	18,800	58,863
1907	2	306	2,142	13,220	39,660	13,526	41,802
1908	2	....	....	19,174	67,109	19,174	67,109
1909	2	250	1,255	9,818	42,687	10,068	43,942
1910	2	420	2,940	16,637	91,504	17,057	94,444
1911	2	715	5,720	16,676	91,718	17,391	97,438
1912	2	377	2,638	6,040	30,200	6,417	32,838
1913	2	....	....	8,910	35,640	8,910	35,640
1914	2	....	....	12,097	65,334	12,097	65,334
1915	2	1,079	6,474	5,131	25,515	6,210	31,989

[a] Burned.

PACK OF CANNED SALMON ON ROGUE RIVER, OREG., IN SPECIFIED YEARS.[a]

Years.	Canneries operated.	Chinook.		Silverside.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1877	1	....	....	....	....	7,804	....
1878	1	....	....	....	....	8,534	....
1879	1	....	....	....	....	8,571	....
1880	1	....	....	....	....	7,773	....
1881	1	....	....	....	....	12,320	....
1882	1	....	....	....	....	19,186	....
1883	1	....	....	....	....	16,156	....
1884	1	....	....	....	....	12,376	....
1885	1	....	....	....	....	9,310	....
1886	1	....	....	....	....	13,147	....
1887	1	....	....	....	....	17,216	....
1888	1	....	....	....	....	21,080	$121,107
1889	1	....	....	....	....	22,000	132,000
1890	1	....	....	....	....	24,000	120,000
1891	1	....	....	....	....	21,000	105,000
1892	1	10,000	$60,000	9,000	$36,000	19,000	96,000
1893	[b] 1	3,200	16,000	....	....	3,200	16,000
1894	1	10,377	41,508	4,385	15,347	14,762	56,855
1895	1	15,000	75,000	3,000	9,000	18,000	84,000
1897	1	15,355	61,420	3,653	10,959	19,008	72,379
1898	1	12,964	51,560	501	1,303	13,465	52,863
1899	1	5,481	20,145	1,745	6,980	7,226	27,125
1900	1	....	....	....	....	....	....
1901	1	2,681	13,405	4,184	17,736	6,865	31,141
1902	1	3,799	20,058	4,001	17,387	7,800	37,445
1903	1	8,418	45,036	4,792	20,366	13,210	65,402
1904	1	16,000	64,000	3,255	11,392	19,255	75,392
1905	1	18,500	111,000	1,500	6,375	20,000	117,375
1906	1	12,000	72,000	6,000	18,000	18,000	90,000
1907	1	7,537	56,528	1,786	8,930	9,323	65,458
1908	1	4,354	32,655	2,650	13,250	7,004	45,905
1909	1	186	1,200	680	2,977	866	4,177
1910	1	232	1,786	2,711	16,266	2,943	18,052
1913	1	3,020	27,180	2,403	11,857	5,423	39,037
1914	1	6,938	62,060	987	5,453	7,925	67,513
1915	2	19,094	135,301	515	2,369	19,609	137,670

[a] Shut down in 1911 and 1912 through the closing of the river to all fishing.

[b] Burned down during season. Not opened the next year.

PACK OF CANNED SALMON ON SMITH RIVER, CAL., IN SPECIFIED YEARS.

Years.	Canneries operated.	Quinnat.		Silverside.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1878	1	4,377	$22,098	....	....	4,377	$22,098
1880	1	7,500	41,250	....	....	7,500	41,250
1884	1	5,500	33,000	....	....	5,500	33,000
1885	1	1,550	9,300	....	....	1,550	9,300
1886	1	2,347	14,082	....	....	2,347	14,082
1893	1	1,500	7,500	500	$1,500	2,000	9,000
1894	1	1,500	7,500	500	1,500	2,000	9,000
1895	1	2,250	9,000	....	....	2,250	9,000
1914	1	....	....	3,000	18,000	3,000	18,000
1915	1	1,955	13,685	1,078	6,220	3,033	19,905

PACK OF CANNED SALMON ON KLAMATH RIVER, CAL., IN SPECIFIED YEARS.

Years.	Canneries operated.	Quinnat.		Silverside.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1888	1	4,400	$26,400	....	....	4,400	$26,400
1892	1	1,047	4,188	....	....	1,047	4,188
1893	1	1,600	6,400	....	....	1,600	6,400
1894	1	1,700	6,800	....	....	1,700	6,800
1895	1	1,200	5,321	400	$1,500	1,600	6,821
1899	1	1,600	8,000	....	....	1,600	8,000
1903	1	2,500	13,500	....	....	2,500	12,500
1904	1	3,400	20,800	....	....	3,400	20,800
1909	1	5,633	33,000	....	....	5,633	33,000
1910	1	8,016	52,000	....	....	8,016	52,000
1911	1	7,400	48,000	204	816	7,604	48,816
1912	2	18,000	117,000	....	....	18,000	117,000
1913	2	6,376	40,500	....	....	6,376	40,500
1914	1	7,500	48,500	3,500	14,000	11,000	62,500
1915	1	10,400	72,800	2,500	13,000	12,900	85,800

PACK OF CANNED SALMON ON EEL RIVER, CAL., IN SPECIFIED YEARS.[a]

Years.	Canneries operated.	Quinnat.		Years.	Canneries operated.	Quinnat.	
		Cases.	Value.			Cases.	Value.
1877	1	8,500	$51,000	1885	1	5,750	....
1878	1	10,800	56,700	1886	1	12,500	$75,000
1880	1	6,250	....	1910	1	6,000	42,000
1882	1	15,000	....	1911	1	8,400	53,500
1884	1	8,200	....	1912	1	11,000	71,500

[a] Shut down in 1913, 1914, and 1915.

PACK OF CANNED SALMON ON THE SACRAMENTO RIVER IN SPECIFIED YEARS.

Years.	Canneries operated.	Quinnat.		Years.	Canneries operated.	Quinnat.	
		Cases.	Value.			Cases.	Value.
1864	1	2,000		1891		10,353	
1865	1	2,000		1892		2,281	
1874		2,500		1893	3	23,336	
1875		3,000		1894	2	28,463	
1876	2	10,000		1895	3	25,185	$111,821
1877		21,500		1896		13,387	
1878	6	94,017	$153,692	1897		38,543	
1879	4	13,855	89,577	1898		29,731	
1880	9	62,000		1899		32,580	150,658
1881		181,200		1900		30,304	
1882	19	200,000		1901		17,500	
1883	21	123,000		1902		14,043	
1884		81,450		1903		8,200	
1885	6	90,000		1904	2	14,407	66,936
1886	9	39,300		1905	1	2,780	
1887		36,500		1911	1	4,142	28,994
1888	6	68,075	423,750	1913	1	950	6,650
1889	3	57,300		1914	2	17,315	95,232
1890		25,065		1915[a]	2	6,179	42,753

[a] In 1915 a cannery at Monterey packed 950 cases of chinook salmon, valued at $7,300, which has been included.

PACK OF CANNED SALMON IN ALASKA, BY DISTRICTS, FROM THE INCEPTION OF THE INDUSTRY.

Years.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Canneries operated.	Pack.	Canneries operated.	Pack.	Canneries operated.	Pack.	Canneries operated.	Pack.
		Cases.		*Cases.*		*Cases.*		*Cases.*
1878	2	8,159					2	8,159
1879	2	12,530					2	12,530
1880	1	6,539					1	6,539
1881	1	8,977					1	8,977
1882	1	11,501	2	10,244			3	21,745
1883	4	20,040	2	28,297			6	48,337
1884	4	22,189	2	42,297	1	[a] 400	7	64,886
1885	3	16,728	2	52,687	1	14,000	6	83,415
1886	4	18,660	2	74,583	3	48,822	9	142,065
1887	5	31,462	2	102,515	3	72,700	10	206,677
1888	6	81,128	6	241,101	4	89,886	16	412,115
1889	12	141,760	21	461,451	4	115,985	37	719,196
1890	12	142,901	19	421,300	4	118,390	35	682,591
1891	11	156,615	14	511,367	5	133,418	30	801,400
1892	7	115,722	6	295,496	2	63,499	15	474,717
1893	8	136,053	11	399,815	3	107,786	22	643,654
1894	7	142,544	10	435,052	4	108,844	21	686,440
1895	7	148,476	10	327,919	6	150,135	23	626,530
1896	9	262,381	12	485,990	8	218,336	29	966,707
1897	9	271,867	13	382,899	7	254,312	29	909,078
1898	9	251,385	14	395,009	7	318,703	30	965,097
1899	9	310,219	14	356,095	9	411,832	32	1,078,146
1900	16	456,630	14	492,232	12	599,277	42	1,548,139
1901	21	735,449	13	562,142	21	719,213	55	2,016,804
1902	26	906,676	12	583,690	26	1,046,458	64	2,536,824
1903	21	642,305	12	417,175	27	1,186,730	60	2,246,210
1904	12	569,003	11	499,485	32	885,268	55	1,953,756
1905	13	433,607	9	371,755	25	1,089,154	47	1,894,516
1906	20	767,285	8	473,024	19	978,735	47	2,219,044
1907	22	887,503	8	522,836	18	759,534	48	2,169,873
1908	23	1,011,648	8	425,721	19	1,169,604	50	2,606,973
1909	19	852,870	8	391,054	18	1,151,553	45	2,395,477
1910	23	1,066,399	10	432,517	19	914,138	52	2,413,054
1911	32	1,580,868	11	499,743	21	743,206	64	2,823,817
1912	51	2,033,648	14	625,062	22	1,395,931	87	4,054,641
1913	42	1,782,896	14	447,249	23	1,509,038	79	3,739,185
1914	44	1,776,075	14	658,791	23	1,621,787	81	4,056,653
1915	46	2,540,111	17	632,734	24	1,316,171	87	4,489,016
Total		20,360,820		13,059,318		19,312,845		52,732,983

[a] Experimental pack.

PACK OF CANNED SALMON IN ALASKA FROM 1898 TO 1915, BY SPECIES.

Years.	Coho, or silver.		Chum, or keta.		Humpback, or pink.	
	Cases.	Value.	Cases.	Value.	Cases.	Value.
1898	54,711	....	5,184	....	100,399	....
1899	39,402	....	1,031	....	140,159	....
1900	50,984	....	30,012	....	232,022	....
1901	65,509	....	47,464	....	541,427	....
1902	62,723	....	150,840	....	540,002	....
1903	120,506	....	35,002	....	355,799	....
1904	85,741	....	21,178	....	290,333	....
1905	67,294	$215,675	41,972	$113,056	168,597	$408,194
1906	109,141	382,109	254,812	730,235	348,297	1,046,901
1907	85,190	337,384	184,173	547,757	561,973	1,709,280
1908	68,927	274,029	218,513	554,197	644,132	1,733,379
1909	56,556	231,029	120,712	274,110	464,873	1,114,939
1910	114,695	550,666	254,218	773,400	554,322	1,764,055
1911	133,958	702,647	323,706	1,190,563	1,006,278	3,972,706
1912	105,198	741,377	664,633	1,584,130	1,280,138	3,296,898
1913	75,770	261,654	290,916	642,948	1,372,881	3,550,587
1914	157,063	690,086	663,850	2,240,765	998,040	3,450,110
1915	126,570	588,903	484,405	1,356,460	1,870,373	5,619,486

Years.	King, or spring.		Red, or sockeye.		Total.	
	Cases.	Value.	Cases.	Value.	Cases.	Value.
1898	12,862	....	782,941	....	965,097	....
1899	25,400	....	884,254	....	1,078,146	....
1900	37,715	....	1,197,406	....	1,548,139	....
1901	43,069	....	1,319,335	....	2,016,804	....
1902	59,104	....	1,685,546	....	2,536,824	....
1903	47,609	....	1,687,344	....	2,246,210	....
1904	41,956	....	1,505,548	....	1,953,756	....
1905	42,125	$141,999	1,574,428	$5,335,547	1,894,516	$6,304,671
1906	30,834	116,222	1,475,981	5,620,875	2,219,044	7,896,392
1907	43,424	181,718	1,295,113	5,915,237	2,169,873	8,781,306
1908	23,730	96,867	1,651,770	7,524,251	2,606,973	10,185,783
1909	48,034	207,634	1,706,302	7,610,550	2,395,477	9,438,182
1910	40,221	214,892	1,450,267	7,774,390	2,413,054	11,086,322
1911	45,518	295,098	1,315,318	8,363,223	2,823,817	14,593,287
1912	43,317	243,331	1,900,355	10,428,451	4,054,641	16,291,927
1913	34,370	139,053	1,965,257	8,936,363	3,739,185	13,531,604
1914	48,039	241,105	2,301,643	12,369,517	4,056,653	18,920,589
1915	85,694	458,000	1,921,971	11,907,203	4,489,016	19,930,010

PACK OF CANNED SALMON IN BRITISH COLUMBIA SINCE THE INCEPTION OF THE INDUSTRY, BY WATERS.

Years.	Canneries operated.	Fraser River.	Skeena River.	Rivers Inlet.	Nass River.	Outlying districts.	Total.
		Cases.	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
1876	2	7,247	....	....	....	....	7,247
1877	5	55,387	3,000	....	....	....	58,387
1878	8	81,446	8,500	....	....	....	89,946
1879	9	50,490	10,603	....	....	....	61,093
1880	9	42,155	19,694	....	....	....	61,849
1881	11	142,516	21,560	....	....	5,500	169,576
1882	16	199,204	24,522	5,635	6,500	4,600	240,461
1883	20	105,701	31,157	10,780	9,400	6,400	163,438
1884	14	34,007	53,796	20,383	8,500	7,000	123,706
1885	9	89,617	12,900	....	....	6,000	108,517
1886	16	99,177	37,587	15,000	....	1,200	152,964
1887	20	130,088	58,592	11,203	....	4,200	204,083
1888	21	76,616	70,106	20,000	12,318	5,000	184,040
1889	28	310,122	58,406	21,722	19,800	7,162	417,211
1890	33	244,352	91,645	33,500	24,700	17,000	411,297
1891	38	177,989	77,057	36,500	11,058	11,907	314,511
1892	36	98,491	90,750	14,955	26,100	18,425	248,721
1893	44	474,237	59,021	35,416	15,680	25,848	610,202
1894	42	363,566	61,005	40,161	20,000	7,500	492,232
1895	49	432,920	69,356	58,575	20,541	6,300	587,692
1896	56	375,344	97,863	107,473	14,649	22,453	617,782
1897	65	879,776	61,310	40,000	20,000	26,007	1,027,183
1898	67	264,225	80,102	105,362	20,000	22,862	492,551
1899	68	527,396	112,562	76,428	19,442	29,691	765,519
1900	69	331,371	135,424	74,196	20,200	45,349	606,540
1901	78	998,913	125,845	66,794	15,004	40,656	1,247,212
1902	69	327,197	155,936	70,296	23,212	50,513	627,161
1903	61	237,162	96,688	69,380	18,094	50,514	473,847
1904	51	128,903	154,869	94,292	29,587	57,243	465,894
1905	64	846,998	114,085	83,122	32,725	90,892	1,167,822
1906	59	226,744	102,420	122,876	32,534	84,854	629,460
1907	42	163,116	159,255	94,064	31,832	99,192	547,459
1908	50	89,184	209,177	75,090	46,908	145,944	566,303
1909	86	567,203	142,740	91,014	40,990	151,086	993,033
1910	58	223,148	222,035	129,398	39,720	147,900	762,201
1911	69	301,344	254,410	101,066	65,684	226,461	948,965
1912	60	173,921	254,258	71,162	137,697	359,538	996,576
1913	81	732,059	164,055	53,423	68,096	330,268	1,353,901
1914	56	328,380	237,634	109,062	94,890	341,073	1,111,039
1915	61	289,199	279,161	146,838	104,289	313,894	1,133,381
Total	....	11,227,008	4,081,075	2,105,290	1,050,150	2,777,507	21,240,999

PACK, BY SPECIES AND DISTRICTS, OF CANNED SALMON IN BRITISH COLUMBIA FROM 1903[a] TO 1915.

Districts and species.	1903	1904	1905	1906	1907	1908	1909
	Cases.	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
Fraser River district:							
Chums	....	1,066	....	....	....	....	....
Cohos	25,728	45,667	30,536	34,413	35,766	24,198	21,540
Pinks	4,504	....	3,304	15,543	63,530	415	1,987
Sockeyes	204,809	72,688	537,489	183,007	59,815	63,126	542,248
Springs, red	2,084	9,482	5,807	6,503	3,448	1,427	1,428
Springs, white	....	....	....	1,020	557	18	....
Total	237,125	128,903	577,136	240,486	163,116	89,184	567,203
Skeena River district:							
Chums	....	35,329	....	....	....	....	....
Cohos	9,648	5,515	7,247	16,897	15,247	10,085	12,249
Pinks	20,045	....	7,523	38,991	25,217	45,404	28,120
Sockeyes	50,968	93,404	84,717	86,394	108,413	139,846	87,901
Springs, red	18,008	20,621	14,598	20,138	10,378	13,374	11,727
Springs, white	....	....	....	....	....	468	742
Total	98,669	154,869	114,085	162,420	159,255	209,177	140,739
Rivers Inlet district:							
Chums	....	61	....	....	....	....	....
Cohos	219	358	....	66	5,040	9,505	1,400
Pinks	180	....	....	....	700	479	....
Sockeyes	68,119	93,862	82,771	122,631	87,874	64,652	89,027
Springs, red	872	11	351	181	450	454	587
Total	69,390	94,292	83,122	122,878	94,064	75,090	91,014
Nass River district:							
Chums	....	31	....	....	....	....	....
Cohos	2,187	1,697	3,083	5,997	6,093	8,348	6,818
Pinks	....	....	1,840	3,450	5,957	6,612	3,589
Sockeyes	8,438	15,000	24,462	22,166	17,813	27,584	28,246
Springs, red	1,475	2,357	3,340	858	1,288	3,263	2,280
Springs, white	....	....	....	....	....	....	57
Steelheads	....	....	....	63	681	1,101	....
Total	12,100	19,085	32,725	32,534	31,832	46,908	40,990
Outlying districts:							
Chums	....	1,155	....	....	....	....	....
Cohos	14,136	13,114	3,292	11,759	25,754	29,781	19,911
Pinks	2,653	....	1,303	10,321	23,300	23,538	12,848
Sockeyes	36,383	48,272	51,234	45,481	40,159	59,815	93,019
Springs, red	3,218	6,204	4,563	3,581	7,595	6,915	2,196
Springs, white	....	....	....	....	2,382	2,245	....
Steelheads	....	....	....	....	2	36	....
Total	56,390	68,745	60,392	71,142	99,192	122,330	127,974
TOTAL BY SPECIES.							
Chums	....	37,642	....	....	....	....	....
Cohos	51,918	66,351	44,458	69,132	87,900	81,917	61,918
Pinks	27,382	....	13,970	[b]68,305	[b]118,704	[b]76,448	[b]46,544
Sockeyes	368,717	323,226	1,080,673	459,679	314,074	355,023	840,441
Springs, red	25,657	38,675	28,359	31,261	23,159	25,433	18,218
Springs, white	....	....	....	1,083	2,939	2,731	799
Steelheads	....	....	....	....	683	1,137	....
Grand total	473,674	465,894	1,167,460	629,460	547,459	542,689	967,920

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[a] In 1901 in the Fraser River district 920,313 cases of sockeyes were packed, and in 1902 sockeyes were packed as follows: 293,477 cases in Fraser River district, 117,677 cases in Skeena River district, 66,519 cases in Rivers Inlet district, 20,953 cases in Nass River district, and 20,510 cases in outlying districts.

[b] Pinks and chums combined.

PACK, BY SPECIES AND DISTRICTS, OF CANNED SALMON IN BRITISH COLUMBIA FROM 1903 to 1915—Continued.

Districts and species.	1910	1911	1912	1913	1914	1915
Fraser River district:	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
Chums	52,177	47,237	12,961	22,220	74,726	18,539
Cohos	27,855	39,740	28,574	11,648	38,429	34,114
Pinks	128	142,101	574	9,973	6,067	128,555
Sockeyes	133,045	58,487	108,784	684,596	185,483	89,040
Springs, red	1,018	7,028	14,655	3,573	9,485	15,388
Springs, white	8,925	6,751	8,373	49	14,000	3,532
Steelheads						31
Total	223,148	301,344	173,921	732,059	328,390	289,199
Skeena River district:						
Chums		70	504		8,229	5,769
Cohos	11,531	23,376	a 39,935	18,647	16,378	32,190
Pinks	13,473	81,956	97,586	66,045	71,021	107,578
Sockeyes	187,246	131,066	92,498	52,927	130,166	116,553
Springs, red	9,546	15,514	19,232	23,250	11,529	15,069
Springs, white	239	2,428	4,501	3,186	211	204
Total	222,035	254,410	254,256	164,055	237,634	279,161
Rivers Inlet district:						
Chums		288	3,845		5,023	5,387
Cohos	2,075	6,287	11,010	3,660	7,789	7,115
Pinks	19	5,411	8,800	2,097	5,784	2,904
Sockeyes	126,921	88,763	112,884	61,745	89,890	130,350
Springs, red	383	317	681	594	566	1,022
Springs, white			486			
Total	129,398	101,066	137,697	68,096	109,052	146,778
Nass River district:						
Chums	351	5,189	3,245	2,987	25,569	11,076
Cohos	6,285	7,842	12,468	3,172	9,276	15,171
Pinks	895	11,467	12,476	20,539	25,333	34,879
Sockeyes	30,810	37,327	36,037	23,574	31,327	39,349
Springs, red	1,228	3,434	5,710	2,999	2,660	3,053
Springs, white	11	325	1,226	152	725	648
Steelheads	140	100				113
Total	39,720	65,684	71,162	53,423	94,890	104,289
Outlying districts:						
Chums	5,834	39,167	37,770	52,756	70,827	41,229
Cohos	26,636	42,457	73,422	32,695	48,119	58,306
Pinks	20,098	64,312	128,286	94,233	112,145	93,376
Sockeyes	87,893	67,866	94,559	149,336	99,870	100,750
Springs, red	7,138	12,458	21,967	7,017	8,668	17,202
Springs, white	301	201	3,534	229	1,484	1,986
Steelheads						985
Total	147,900	226,461	359,538	336,268	341,073	313,834
TOTAL BY SPECIES.						
Chums	58,362	91,951	58,325	77,965	184,474	82,000
Cohos	74,382	119,702	165,202	69,822	120,201	146,956
Pinks	34,613	306,247	247,743	192,887	220,340	367,352
Sockeyes	565,915	383,509	444,762	972,178	536,696	476,042
Springs, red	19,313	38,751	62,245	37,433	32,908	51,734
Springs, white	9,476	9,705	18,092	3,616	16,420	6,370
Steelheads	140	100	207			2,927
Grand total	762,201	948,965	996,576	1,353,901	1,111,039	1,133,381

a Includes 207 cases of steelheads.

PICKLING INDUSTRY.

The salmon-pickling industry was so overshadowed by its giant brother, the canning industry, that statistical data, except for Alaska, were found in extremely fragmentary shape, and only that portion is shown relating to Alaska from the time of annexation to 1915.

PACK OF SALTED SALMON IN ALASKA, 1868 TO 1915.

Years.	Salmon.		Salmon bellies.		Dry-salted salmon.	
	Barrels.	Value.	Barrels.	Value.	Pounds.	Value.
1868	2,000	$16,000				
1869	1,700	13,600				
1870	1,800	14,400				
1871	700	6,300				
1872	1,000	9,000				
1873	900	7,200				
1874	1,400	11,200				
1875	1,200	9,600				
1876	1,800	14,400				
1877	1,950	15,700				
1878	2,100	16,800				
1879	3,500	28,000				
1880	3,700	29,600	300	$3,300		
1881	1,700	15,840				
1882	5,890	53,010				
1883	7,251	65,259				
1884	6,106	54,954				
1885	3,230	29,070				
1886	4,861	43,749				
1887	3,978	35,802				
1888	9,500	85,500				
1889	6,457	58,013				
1890	18,039	162,351				
1891	8,913	71,304				
1892	17,374	140,057	53	815		
1893	24,005	120,083				
1894	32,011	176,080				
1895	14,234	85,404				
1896	9,314	65,198	150	1,200		
1897	15,846	110,926	2,846	28,460		
1898	22,670	181,360	580	5,800		
1899	22,382	167,865	235	2,350		
1900	31,852	238,890	2,353	23,530	511,400	$10,228
1901	24,477	171,339	652	3,816		
1902	30,384	212,688	328	2,952		
1903	27,921	223,368	3,667	32,973	300,000	5,500
1904	13,674	89,209	208	1,950	966,812	16,180
1905	19,071	143,811	1,360	11,355	7,280,734	115,643
1906	17,283	126,194	1,338	13,644	1,107,680	16,969
1907	22,207	203,127	2,965	37,422	107,580	1,505
1908	31,472	266,713	7,600	85,994	20,800	416
1909	28,443	183,400	1,970	25,358	71,600	1,038
1910	12,779	111,634	1,626	19,007	22,178	554
1911	8,483	102,477	1,337	15,561	33,285	1,340
1912	34,602	305,928	37	606		
1913	37,881	272,726	451	6,523	21,282	1,225
1914	25,954	247,195	408	5,467	12,200	810
1915	12,068	157,457	571	13,610		
Total	529,294	4,041,445	28,802	313,536	10,388,284	168,023

ALASKA PICKLED-SALMON PACK, 1906 TO 1915, BY SPECIES, QUANTITY,[a] AND VALUE.

Species.	1906		1907		1908		1909		1910	
	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.
Whole salmon:										
Coho	539	$5,642	1,665	$16,406	692	$5,648	318	$2,485	160	$1,304
Chum	231	1,550	233	1,521	123	707	35	190	....	....
Humpback	2,446	13,852	4,248	29,374	2,346	17,935	1,557	9,405	330	1,996
King	1,007	8,058	964	10,684	660	6,813	441	3,798	352	3,309
Red	13,061	97,092	15,197	145,142	30,517	262,274	26,508	167,298	11,931	104,649
Total	17,284	126,194	22,307	203,127	34,337	293,377	28,859	183,176	12,773	111,550
Bellies:										
Coho	....	....	191	2,696	229	3,535	255	3,843	128	1,135
Chum	30	150	....	....	117	690	....	....	70	770
Humpback	1,173	13,188	1,800	21,080	2,447	28,140	728	7,438	616	6,135
King	22	185	84	1,002	48	720	35	175	6	128
Red	13	121	890	12,644	1,895	26,245	942	13,902	806	10,839
Total	1,238	13,644	2,965	37,422	4,736	59,330	1,970	25,358	1,626	19,007
Backs, etc.:										
Humpback	....	....	....	....	....	....	56	224	....	....
King	....	....	....	....	....	....	....	....	2	24
Red	....	....	....	....	....	....	....	....	4	60
Total	....	....	....	....	....	....	56	224	6	84
Grand total	18,522	139,838	25,272	240,549	39,073	352,707	30,885	208,758	14,405	130,641

Species.	1911		1912		1913		1914		1915	
	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.
Whole salmon:										
Coho	223	$2,149	1,165	$9,565	1,006	$6,453	365	$2,767	1,763	$19,393
Chum	133	666	93	652	100	778	53	293	325	2,925
Humpback	1,122	11,238	4,236	28,304	2,724	18,181	482	2,964	662	5,958
King	600	8,095	225	2,442	135	1,410	269	2,586	377	4,147
Red	6,239	79,578	28,883	264,965	33,916	245,905	24,785	238,586	8,931	125,034
Total	8,317	101,726	34,602	305,928	37,881	272,726	25,954	247,196	12,058	157,457
Bellies:										
Coho	38	489	....	....	54	946	67	962	....	....
Chum	7	77	....	....	67	941	18	180	....	....
Humpback	676	5,122	37	606	324	4,546	229	2,640	133	2,650
King	2	30	....	....	....	....	2	13	....	....
Red	614	9,843	....	....	6	90	92	1,672	438	10,960
Total	1,337	15,561	37	606	451	6,523	408	5,467	571	13,610
Backs, etc.:										
Humpback	150	600	....	....	....	....	....	....	....	....
King	1	15	....	....	....	....	....	....	....	....
Red	15	136	....	....	....	....	....	....	....	....
Total	166	751	....	....	....	....	....	....	....	....
Grand total	9,820	118,038	34,639	306,534	38,332	279,249	26,362	252,663	12,629	171,067

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[a] Barrels hold 200 pounds of fish; when of a different size they have been reduced to conform to this weight.

MILD-CURING INDUSTRY.

The beginning of this industry on the Pacific coast is of comparatively recent date, and the following table is complete, with the possible exception of a few tierces, which may not have been reported for the coastal rivers of Oregon:

NUMBER OF TIERCES OF MILD-CURED SALMON PACKED ON THE PACIFIC COAST FROM 1897 TO 1915.[a]

Years.	Alaska.	British Columbia.	Puget Sound, Wash.	Grays Harbor, Wash.	Willapa Harbor, Wash.	Columbia River (both sides).	Coastal rivers, Oreg.	Eel River, Cal.	Sacramento River, Cal.	Monterey Bay, Cal.	Total.
1897						400					400
1898	70					700					770
1899	130			375		1,250					1,755
1900						1,275			950		2,225
1901	67		600			3,000			3,100		6,767
1902	67		425			4,213	188		2,325	504	7,722
1903	8		824			6,725			3,600	354	11,511
1904	34		1,250			9,088		200	4,719	248	15,539
1905	189	1,175	3,000			9,805	415		2,970	310	17,873
1906	1,126	957				8,000	740	175	2,177	510	13,685
1907	1,657	1,993	2,060	20	100	6,070	740	140	4,102	582	17,464
1908	1,378	1,060				4,900			3,243	252	10,833
1909	2,292	1,560	2,109	75	29	5,540	580	60	5,111	911	18,267
1910	3,357	1,638	2,435	67		7,922	1,398		5,516	75	22,408
1911	3,164	1,965	2,745	100	30	8,185	1,247	130	2,011	100	19,717
1912	5,245	1,489	3,013	357	40	5,824	3,082	100	3,274		22,424
1913	7,443	3,150	3,923	250	50	5,746	2,381		4,789	550	28,282
1914	4,001	3,182	1,934			5,206	457		1,829	1,476	18,174
1915	2,966	1,119	2,235			4,078	333	3	1,630	942	13,306
Total.	33,284	19,288	26,553	1,244	249	97,986	11,541	808	51,355	6,874	240,182

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[a] The net weight of fish in a tierce is about 800 pounds. King, chinook, or spring salmon were used almost exclusively. From most places the data are complete from the time of the inception of the industry, but from a few minor places the data are somewhat fragmentary.

YUKON TERRITORY, CANADA.

Some salmon fishing is carried on in that section of the upper Yukon River which lies in Yukon Territory, Dominion of Canada. The species taken are principally king and chum, and these are sold mainly in a fresh condition. The following table shows the quantity taken and the value of same in certain years:

CATCH OF SALMON IN YUKON TERRITORY, CANADA, IN SPECIFIED YEARS.

Years.	Salmon.		Years.	Salmon.	
	Pounds.	Value.		Pounds.	Value.
1908	70,000	$5,600	1912	224,100	$22,410
1909	138,574	17,566	1913	182,000	18,200
1910	169,900	18,689	1914	188,600	18,860
1911	229,000	22,900	1915	157,000	15,700

MARKET PRICES FOR CANNED SALMON.

The manner of fixing the selling price at which the canner is willing to dispose of his canned product varies slightly in certain regions. In May or June, when the spring-packing season has sufficiently advanced so that a line can be gotten on the probable pack of chinook, the highest priced of the pack, the Columbia River canners agree upon a price, this usually being high or low, as the pack is small or large.

Since the Alaska Packers Association was formed, through a combination of a number of canneries operating in the Territory of Alaska, it has packed annually in recent years about one-fourth of the salmon canned. It also owns several canneries on Puget Sound, thus being quite a factor in that region also.

In the early days of the association the custom grew up amongst the smaller packers of Alaska and Puget Sound of waiting until the association fixed the prices on its own pack, when the others would generally fall into line with the same prices for their packs. This custom is still in vogue. At no time has it ever been compulsory on the part of any packer to adopt the same prices as the association. In fact, it has sometimes been the case that, while the small packer publicly quoted the association's opening prices, yet in secret he was shading it by 2½ to 5 cents per dozen on certain grades. In recent years this has frequently been the case and the big packers, who adhered to the opening prices, have had to sit idly by and watch their small competitors underselling them and getting the bulk of the business until they had finally disposed of their goods, when, necessarily, they would have to drop out of the market until the next season.

Occasionally the other packers do not like a certain quotation of the association and make one more nearly in consonance with their own views. This happened in 1913, when the association quoted 60 cents for chums, while the Puget Sound canners quoted 55 cents for this grade, and in 1915 when the association quoted 65 cents for chums and the Puget Sound interests 70 cents for the same grade, thus showing clearly the independence of the smaller packers.

Owing to a peculiar feature of the salmon marketing business, more depends upon the opening prices than appears on the surface to the uninitiated.

Shortly after the first of the year buyers throughout the world begin to take stock of their salmon supplies and soon thereafter begin placing their "future" orders. These cover the quantity required of each grade, and when the buyer orders through a broker the orders are placed subject to a contract similar to the following:

> The undersigned hereby authorizes ——— to book the number of cases of canned salmon specified below; said booking to be filed with packers for delivery from ———

(coming year) pack, subject to buyers' approval of opening prices when named; *the option being granted buyers of confirming the total number* of cases specified below; *confirming a smaller quantity*, or *declining any confirmation.*

——— furthermore agrees that *buyers shall have the option of increasing quantities* listed below, when he names opening prices for his packers, contingent upon his ability to secure at that time an increased allotment from his packers. In event ——— secures an increased allotment from his packers insufficient to meet all increases requested by his patrons, he will distribute such increase as he can secure among the dealers who have filed conditional contracts with him, according to the date order that said contracts have been received in his office.

Under this form of contract the packer is expected to be ready to fulfill the terms of same, except in case of a short pack, when the orders are generally prorated, i. e., all orders are proportionately reduced until they come within the compass of the pack. Should the buyer dislike the opening price he has the privilege of canceling the order. While this latter privilege may not, at first glance, look just to the packer, yet it is doubtful if any buyer would place a "future" order unless he was assured of a chance to cancel his order should he feel that too high a sum was fixed in the opening prices.

Some canneries contract to sell their entire output to one buyer, and the price fixed is usually the opening prices for the year in question. In such cases the buyer and seller are both compelled to abide by the price, no matter how unjust one or the other may consider it.

The association does not announce its opening prices until late in August or early in September, when the greater part of the packing is over with and a good line on the total pack has been obtained, and it speaks well for the discernment of the officials of the association that their judgment as to prices should meet with the general approval as often as it does.

OPENING PRICES FOR A SERIES OF YEARS.

Below are shown the yearly opening prices on the various grades and sizes from 1890 to 1915. The most interesting part of this is the increase shown in the value of high-grade salmon. Columbia River chinook was quoted at $1.05 for 1-pound talls in 1897, and it gradually advances until in 1915 it is quoted at $1.90. Alaska red 1-pound talls in 1897 sold for 90 cents, the lowest during the period in question, advancing, with occasional recessions, until in 1911 it reached high-water mark of $1.60. In 1915 the opening price was $1.50. In 1897 Puget Sound 1-pound tall sockeye sold for 80 cents, 10 cents below Alaska red. In 1898 it sold for 20 cents less than reds. In 1902 it sold for $1 as compared with 95 cents for Alaska red, and from that time on brought a higher price, being quoted at $1.90 in 1915 as compared with $1.50 for Alaska red.

Medium red or coho did not figure in the opening prices until 1908, when Puget Sound coho sold for 5 cents a dozen more than Alaska coho. Very shortly thereafter, however, both were classed together and sold for the same price. This grade has not had the wide fluctuations of the others, due mainly to the generally small pack made annually.

Pink salmon has been the football of the salmon market ever since the pack became of sufficient size to become a feature in it. The size of the pack has been steadily increasing, as the fish became better known, and while the price obtained has been excellent in certain years (in 1911 it sold at $1 per dozen, the highest point reached), usually the price has been low. In 1897 it was quoted at 65 cents. In 1915 the opening price was 75 cents, but as a matter of fact a large part of the pack really sold for 65 cents. The lowest point it reached was in 1903, when it was quoted at 50 cents a dozen.

It is only of recent years that chum salmon has become a factor in the market. Although sold for some time before then, chum salmon appears first in the regular opening prices in 1908, when they were quoted at 70 cents a dozen. In 1913 it was quoted at 55 cents, while the opening price in 1915 was 70 cents on Puget Sound and 65 cents at San Francisco.

The pack of Alaska and Puget Sound kings, or springs, has always been small, and while they have always been quoted at $1 per dozen or better (in 1911 they were quoted at $1.80) they have always been slow sellers. It is extremely improbable that the canned pack will increase much in the future, as this fish is the best for mild curing, and as the mild curers are able to offer better prices for the raw fish than the canneries, they will always get the fish when desired.

OPENING PRICES PER DOZEN CANS SINCE 1890.

1890 TO 1902.

Years and species.	Talls.
1890.	
Columbia River chinook	$1.40
Alaska red	1.20
Alaska pink	.75
1891.	
Columbia River chinook	1.35
Alaska red	1.20
Alaska pink	.75
1892.	
Columbia River chinook	1.35
Alaska red	1.15
Alaska pink	.75
1893.	
Columbia River chinook	1.32½
Alaska red	1.17½
Alaska pink	.65
1894.	
Columbia River chinook	1.35
Alaska red	1.10
Alaska pink	.60
1895.	
Columbia River chinook	$1.32½
Alaska red	1.15
Alaska pink	.80
1896.	
Columbia River chinook	1.25
Alaska red	1.10
Alaska pink	.75
1897.	
Columbia River chinook	1.05
Alaska red	.95
Puget Sound sockeye	.80
Alaska pink	.65
1898.	
Columbia River chinook	1.05
Alaska red	.97½
Puget Sound sockeye	.80
Alaska pink	.65
1899.	
Columbia River chinook	$1.25
Alaska red	1.10
Puget Sound sockeye	1.10
Alaska pink	.67½
1900.	
Columbia River chinook	1.60
Alaska red	1.25
Puget Sound sockeye	1.10
Alaska pink	.75
1901.	
Columbia River chinook	1.50
Alaska red	1.25
Puget Sound sockeye	.95
Alaska pink	.75
1902.	
Columbia River chinook	1.35
Alaska red	1.00
Puget Sound sockeye	1.00
Alaska pink	.65

OPENING PRICES PER DOZEN CANS SINCE 1890—Continued.

1903 TO 1915.

Years and species.	Talls.	Flats.	Halves.
1903.			
Puget Sound sockeye	$1.50	$1.60	$0.90
Columbia River chinook	1.35	1.45	.85
Alaska red	1.30		
Alaska pink	.50		
1904.			
Columbia River chinook	1.45	1.15	.90
Puget Sound sockeye	1.55	1.65	.95
Alaska red	1.30		
Alaska pink	.70		
1905.			
Columbia River chinook	1.45	1.55	.90
Puget Sound sockeye	1.35	1.50	4.00
Alaska red	1.00		
Alaska pink	.70		
1906.			
Columbia River chinook	1.50	1.60	1.00
Puget Sound sockeye	1.45	1.60	1.00
Alaska red	.95		
Alaska pink	.75		
1907.			
Columbia River chihook	1.65	1.75	1.05
Puget Sound sockeye	1.60	1.75	1.10
Alaska red	1.15		
Alaska pink	.80		
1908.			
Columbia River chinook	1.65	1.75	1.05
Puget Sound sockeye	1.60	1.75	1.05
Puget Sound pink	.75	.80	
Puget Sound coho	1.05	1.15	.75
Alaska red	1.15		
Alaska king	1.05		
Alaska coho	1.00		
Alaska pink	.70		
Alaska chum	.70		
1909.			
Columbia River chinook, fancy	1.65	1.75	1.05
Puget Sound sockeye	1.35	1.50	1.00
Alaska red	1.15	1.35	.85
Alaska king	1.10		
Alaska coho	1.05	1.20	.70
Alaska pink	.60		
Alaska chum	.57½		
1910.			
Columbia River chinook, fancy	$1.75	$1.90	$1.10
Puget Sound sockeye	1.65	1.80	1.10
Alaska red	1.35	1.50	1.00
Alaska king	1.35		
Alaska pink	.80		
Alaska chum	.77½		
Medium red and coho	1.25	1.40	.80
1911.			
Columbia River chinook, fancy	1.95	2.00	1.30
Puget Sound sockeye	1.95	2.00	1.30
Alaska red	1.60	1.75	1.12½
Alaska medium red	1.45	1.65	1.00
Alaska king	1.80	2.00	1.12½
Pink	1.00	1.15	.80
Chum	.95	1.05	.75
1912.			
Chinook	1.95	2.00	1.25
Sockeye	1.95	2.00	1.30
Alaska red	1.40	1.60	1.15
Alaska medium red	1.15	1.25	.80
Alaska king	1.40	1.60	1.15
Pink	.65	.65	.55
Chum	.62½		.50
1913.			
Chinook	1.95	2.00	1.25
Sockeye	1.50	1.65	1.05
Alaska red	1.15	1.35	.95
Alaska medium red	.85	1.00	.70
Alaska king	1.00	1.15	.90
Pink	.65	.80	.55
Chum	[a].55	.70	.50
1914.			
Chinook	1.95	2.10	1.25
Sockeye	1.95	2.15	1.35
Alaska red	1.45	1.80	1.10
Medium red	1.15	1.35	.82½
Alaska king	1.40		1.10
Pink	.90	1.00	.70
Keta, or chum	.85	.95	.65
1915.			
Chinook	1.90	2.00	1.25
Sockeye	1.95	2.15	1.35
Alaska red	1.50	1.85	1.15
Medium red	1.15	1.30	.75
Alaska king	1.25		
Pink	.75	.85	.57½
Keta, or chum	[b].70	.80	.52½

[a] The opening price in San Francisco was 60 cents.
[b] The opening price in San Francisco was 65 cents.

XI. TRADE WITH OUTLYING POSSESSIONS.

As a result of the war with Spain the United States in 1898 acquired possession of Porto Rico, Guam, and the Philippine Islands, while in the same year Hawaii became a part of this country at its own request, and in 1900 two islands of the Samoan group were acquired by a partition agreement with Great Britain and Germany. The trade with the Philippine Islands is shown to date in the tables of exports and imports to foreign countries, but the trade with the other possessions has been eliminated from these tables and shown separately ever since their annexation to the United States.

HAWAII.

The islands constituting this Territory, owing to their reciprocity treaty with this country for a number of years before annexation, purchased their supplies of salmon from the United States almost exclusively. In recent years the Territory has imported the following quantities of salmon from the mainland:

Years ending June 30—	Canned.		All other, fresh or cured.	Years ending June 30—	Canned.		All other, fresh or cured.
	Pounds.	Value.			Pounds.	Value.	
			Value.				*Value.*
1907	1,126,217	$89,286	$64,232	1912	1,850,567	$194,385	$57,495
1908	965,029	89,025	67,143	1913	1,841,874	173,202	(a)
1909	1,440,410	121,716	73,848	1914	1,418,941	97,532	(a)
1910	1,381,398	113,526	72,194	1915	1,606,848	90,705	(a)
1911	1,231,264	119,872	76,572				

a Not shown separately.

PORTO RICO.

Of recent years the following shipments of domestic salmon have been made to this island:

Years ending June 30—	Canned.		All other, fresh or cured.	Years ending June 30—	Canned.		All other, fresh or cured.
	Pounds.	Value.			Pounds.	Value.	
			Value.				*Value.*
1907	604,627	$53,916	$2,888	1912	710,721	$65,354	$1,208
1908	512,088	48,195	1,428	1913	666,602	66,811	(a)
1909	381,171	34,777	3,810	1914	416,414	41,726	(a)
1910	511,065	43,494	6,243	1915	588,869	56,527	(a)
1911	357,382	30,609	3,858				

a Not shown separately.

PHILIPPINE ISLANDS.

Of recent years the following shipments of domestic salmon have been made to these islands:

Years ending June 30—	Canned.		All other, fresh or cured.	Years ending June 30—	Canned.		All other, fresh or cured.
	Pounds.	Value.			Pounds.	Value.	
			Value.				*Value.*
1909	1,126,470	$74,792	$712	1913	10,122,830	$590,128	(a)
1910	5,425,404	396,604	2,089	1914	5,034,252	266,360	(a)
1911	3,069,118	225,886	3,542	1915	4,106,580	288,546	(a)
1912	5,096,810	422,001	2,437				

a Not shown separately.

ALASKA.

It seems like "carrying coals to Newcastle" to ship canned salmon to Alaska, from which Territory more than half the canned salmon of the world is produced, and yet a small business is done each year in this line, most of the product going to the mining camps and towns somewhat removed from the fishing sections.

The following table shows the shipments of such fish in recent years:

Years ending June 30—	Canned.		All other, fresh or cured.	Years ending June 30—	Canned.		All other, fresh or cured.
	Pounds.	Value.			Pounds.	Value.	
			Value.				*Value.*
1909	67,132	$7,123	$3,966	1912	134,320	$15,022	$4,218
1910	67,658	7,204	3,558	1913	43,346	5,074	(a)
1911	38,265	4,513	1,061	1914	42,945	5,278	(a)

a Not shown separately.

GUAM.

Since annexation, this country and Japan have been competing for the trade of this island, which, in earlier years, Japan controlled quite largely. During the last two years shown in the statement, however, the United States has secured the advantage. The following table shows the extent of the trade, which is made up almost entirely of salted or pickled salmon, only 900 pounds of fresh salmon, valued at $92, having been shipped by this country to Guam in 1908. Since 1909 all the fishery products imported have been lumped under one heading and it has been impossible to distinguish the salmon from the other species.

Years and countries.	Pickled salmon.		Years and countries.	Pickled salmon.	
	Pounds.	Value.		Pounds.	Value.
1906.			1908.		
United States	1,415	$71	United States	7,406	$623
Japan	16,526	1,221	Japan	6,130	465
1907.			1909.		
United States	13,604	1,086	United States	10,779	740
Japan	19,862	1,601	Japan	4,225	344

TUTUILA, SAMOA.

The customs statistics lump the imports of fish under one general heading, thus making it impossible to show separately the imports of salmon.

XII. FOREIGN TRADE IN SALMON.

As we do not consume all of the salmon produced by our fisheries, it is necessary to find a foreign market for the surplus each season, but, as canned salmon has become one of the staples of the world, there is not much difficulty in this respect, especially since our only competitors are Canada, Siberia, and Japan. The two last named have not yet become much of a factor in the canned-salmon market, though they will as their fishing operations are extended. There is more competition in the pickled, fresh, and frozen markets, several European and Asiatic countries being large producers of these goods, as is Canada also, for a considerable proportion of which she is compelled to find an outside market.

EXPORTS OF CANNED SALMON.

From the beginning of the industry a considerable proportion of the salmon canned has been exported, especially of the higher grades. In Europe the chief customer is Great Britain, taking about nine-tenths of all sent to European ports. Great Britain does not, however, consume this quantity, for a considerable part of her importations are reexported. On the North American Continent and adjacent islands the best customers are Mexico, Panama, and the British West Indies, in the order named. In South America, Peru, Argentina, and British Guiana were the leading markets in 1910. In 1908 Chile imported 4,196,060 pounds; in 1909 the importations dropped to 97,993 pounds, but increased in 1910 to 1,556,629 pounds. In Asia, Hongkong and China import canned salmon, although neither buys great quantities. The islands of the Pacific and Indian Oceans are large consumers. British Australasia took 5,474,818 pounds, valued at $551,312, in 1910, and other good customers were the British East Indies and British, French, and German Oceania. In Africa the British and Portuguese possessions are the largest importers.

The movements of these products are naturally often influenced favorably or adversely as the tariffs of the various countries in which they are marketed are raised or lowered.

Some countries maintain excessively high tariffs, among these being Brazil, 30 cents per pound; Colombia, 8½ cents; Mexico, 4 cents; Guatemala, 6½ cents; Paraguay, 7 cents; Uruguay, 6 cents; Austria-Hungary, 8 cents, and Germany, 7 cents. Norway levies 6 cents a pound duty, but this is undoubtedly to protect her own salmon industry.

In but few of the tariff acts is canned salmon distinguished by name, being usually classed as "preserved fish," and as these are usually luxuries in many countries they bear an extra high duty as a result.

In addition to these high duties in some countries, especially in South America, there are various other charges, fees, etc., which materially enhance the value of the goods before they reach the consumer. C. H. Clarke, of the salmon brokerage firm of Kelley-Clarke Co., of Seattle, Wash., prepared and published a statement[a] showing the comparative charges on 100 cases each of red Alaska and pink canned salmon from the time they leave Seattle up to the time they reach the hands of wholesalers in South America. This shows that the f. o. b. Seattle value of the red salmon was $500 and of the pink salmon $280. By the time these goods reached the hands of the Rio de Janeiro wholesalers the red salmon were worth $1,900.07, while the pink salmon were worth $1,677.87. At Montevideo, Uruguay, the red salmon were worth $1,436.01 and the pink salmon $1,213.81. The table is so interesting and instructive that it is reproduced entire herewith.

COMPARATIVE TABLE OF CHARGES ON 100 CASES EACH OF RED ALASKA AND PINK CANNED SALMON UP TO THE TIME THEY REACH HANDS OF WHOLESALERS IN SOUTH AMERICA.

	Argentina (Buenos Aires).		Brazil (Rio de Janeiro).		Chile (Valparaiso).		Ecuador (Guayaquil).	
	Red.	Pink.	Red.	Pink.	Red.	Pink.	Red.	Pink.
F. o. b. Seattle value	$500.00	$280.00	$500.00	$280.00	$500.00	$280.00	$500.00	$280.00
Strapping	5.00	5.00	5.00	5.00				
Freight	104.75	104.75	114.50	114.50	45.00	45.00	45.00	45.00
Marine insurance, 5 per cent f. p. a.	6.10	3.90	6.20	4.00	5.50	3.25	5.50	3.25
C. i. f. value	615.85	393.65	625.70	403.50	550.50	328.25	550.50	328.25
Consular fees in United States	2.00	2.00	3.25	3.25	5.25	4.25	22.35	14.00
Customs duty	519.56	519.56	1,138.78	1,138.78	160.46	160.46	345.37	234.37
Analysis	2.12	2.12	6.47	6.47				
Storage in customhouse	2.41	2.41	33.90	33.90	5.35	5.35		
Handling in customhouse	7.24	7.24			2.51	2.51		
Stamps and entry blanks	1.49	1.49			1.43	1.43		
Statistics			.10	.10				
Internal-revenue tax			7.77	7.77				
Port tax			57.20	57.20				
Customs brokerage	12.74	12.74			7.15	7.15		
Wharfage, lighterage, cartage	7.64	7.64	26.90	26.90	3.65	3.65	19.30	19.30
Value ex customhouse	1,171.05	948.85	1,900.07	1,677.87	736.30	513.05	937.52	706.92

	Paraguay (Asuncion).		Peru (Callao).		Uruguay (Montevideo).		Venezuela (La Guayra).	
	Red.	Pink.	Red.	Pink.	Red.	Pink.	Red.	Pink.
F. o. b. Seattle value	$500.00	$280.00	$500.00	$280.00	$500.00	$280.00	$500.00	$280.00
Strapping	5.00	5.00			5.00	5.00	5.00	5.00
Freight	134.75	134.75	37.50	37.50	104.75	104.75	54.60	54.60
Marine insurance, 5 per cent f. p. a.	9.60	6.30	5.40	3.20	6.10	3.90	5.60	3.40
C. i. f. value	649.35	426.05	542.90	320.70	615.85	393.65	565.20	343.00
Consular fees in United States	2.00	2.00	5.75	3.45	1.05	1.05	12.85	12.85
Customs duty	308.25	308.25	275.86	275.86	779.30	779.30	238.96	238.06
Analysis								
Storage in customhouse								
Handling in customhouse					16.15	16.15		
Stamps and entry blanks			.58	.58	1.55	1.55	1.35	.97
Statistics	.37	.37						
Internal-revenue tax								
Port tax								
Customs brokerage			4.86	4.86	15.50	15.50	5.00	2.80
Wharfage, lighterage, cartage	6.33	6.33	15.69	15.60	6.61	6.61	12.82	12.82
Value ex customhouse	966.30	743.00	845.64	621.14	1,436.01	1,213.81	836.18	611.40

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[a] Pacific Fisherman, vol. 13, no. 5, p. 11, 1915.

The following table shows the fiscal year exports of domestic canned salmon and the countries to which exported for the period from 1900 to 1915, inclusive:

EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915.

Countries.	1900		1901		1902	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Europe:						
Austria-Hungary	2,208	$209	....	....	250	$25
Azores, and Madeira Islands	48	7	950	892	....	....
Belgium	31,118	3,186	5,800	600	336	39
Denmark	24,492	2,455	3,168	326	860	92
France	22,544	2,130	61,790	6,565	23,985	1,880
Germany	16,110	1,431	77,931	7,567	10,905	1,068
Italy	120	10	2,406	244	....	....
Malta, Gozo, etc	....	....	141	21	....	....
Netherlands	3,048	299	288	30	4,800	400
Portugal	19,776	1,779	....	....	336	35
Russia, on Baltic and White Seas	....	....	....	....	8,400	932
Spain	....	....	1,536	151	675	67
Sweden and Norway	1,168	112	720	70	72	8
Switzerland	24	3	....	....	....	....
United Kingdom	18,820,453	1,870,004	31,732,863	3,219,196	30,632,961	2,630,729
North America:						
Dominion of Canada—						
Nova Scotia, New Brunswick, etc	....	....	....	....	10	1
Quebec, Ontario, Manitoba, etc	24,137	2,514	101	10	22,442	2,493
British Columbia	382,811	33,454	1,725,251	223,230	1,866,272	150,063
Newfoundland and Labrador	....	....	....	....	810	73
Miquelon, Langley, etc	240	20	....	....	....	....
Mexico	162,785	14,806	160,425	14,987	387,905	31,041
Central American States—						
British Honduras	16,488	1,604	19,331	2,054	23,467	2,370
Costa Rica	70,458	6,114	69,135	6,768	70,036	5,964
Guatemala	2,666	277	11,361	1,151	15,325	1,324
Honduras	7,193	677	7,081	776	4,994	496
Nicaragua	26,647	2,684	21,543	2,256	17,125	1,635
Salvador	550	60	550	55	1,828	161
Bermuda	59,672	6,158	63,786	7,386	76,456	7,768
West Indies—						
British	239,249	25,651	316,209	33,635	242,909	24,101
Danish	9,085	873	8,612	929	14,536	1,390
Dutch	13,303	1,610	16,591	1,944	15,112	1,506
French	432	45	1,064	137	960	96
Haiti	466	44	595	65	920	88
Dominican Republic	2,764	207	1,899	193	1,581	140
Cuba	8,406	786	20,467	1,883	20,196	1,618
Porto Rico	4,394	390	....	....	....	....
South America:						
Argentina	104,367	8,822	137,751	10,916	88,632	7,816
Bolivia	....	....	240	37	15,110	1,147
Brazil	637,688	76,152	207,033	23,506	87,800	8,380
Chile	647,328	61,800	645,323	64,059	384,766	38,539
Colombia	93,868	9,075	97,163	9,975	86,046	7,451
Ecuador	50,387	5,631	98,887	10,387	24,987	1,866
Guiana—						
British	168,718	16,197	136,192	14,807	146,502	14,604
Dutch	43,096	3,553	61,334	6,542	92,971	8,718
French	3,240	299	2,248	261	8,316	850
Peru	75,621	7,292	124,823	12,526	313,476	24,444
Uruguay	2,837	285	9,408	933	1,016	104
Venezuela	42,125	3,712	66,911	6,913	42,436	4,026
Asia and Oceania:						
Aden	216	22	....	....	....	....
Chinese Empire	40,950	4,265	149,295	15,263	117,043	8,716
China—Russian	....	....	20,634	2,068	9,460	772
Hongkong	63,210	6,488	78,960	8,056	551,860	40,261
Japan	11,500	1,200	265,036	26,990	14,578	1,220
Korea	....	....	1,105	115	2,206	179
Russia, Asiatic	....	....	1,495	145	6,572	521
Turkey in Asia	....	....	144	16	....	....
East Indies—						
British	538,190	55,976	312,805	31,528	733,685	56,912
Dutch	....	....	3,900	400	161,940	12,093

EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915—Continued.

Countries.	1900		1901		1902	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Asia and Oceania—Cont'd.						
British Australasia	2,804,004	$283,110	3,442,085	$342,540	7,131,641	$599,671
British Oceania	....	....	....	....	151,998	10,553
French Oceania	103,940	10,733	118,355	12,026	142,570	11,355
German Oceania	....	....	8,480	874	12,900	997
Guam [a]	480	50	....	....	....	....
Hawaii [b]	880,682	84,808	....	....	....	....
Philippine Islands	1,160	120	39,316	3,925	718,876	46,712
Tonga, Samoa, and all other	112,380	11,646	73,040	7,168	....	....
Tutuila [c]	....	....	....	....	21,176	1,451
Africa:						
British Africa	632,012	57,297	816,423	79,063	2,581,088	219,223
Canary Islands	....	....	656	65	....	....
French Africa	4,230	421	4,080	415	200	21
Liberia	312	30	....	....	....	....
Portuguese Africa	47,812	4,696	35,384	3,459	52,726	4,931
All other Africa	....	....	....	....	6,200	582
Total	27,082,370	2,603,648	41,289,500	4,230,271	47,173,114	3,991,402
RECAPITULATION.						
Europe	18,941,100	1,881,725	31,877,063	3,234,802	30,683,551	2,625,284
North America	1,051,808	98,064	2,443,561	297,440	2,780,844	242,020
South America	1,866,225	192,918	1,577,013	180,862	1,291,998	107,907
Asia	654,126	67,941	853,434	86,571	1,597,346	120,674
Oceania	3,882,646	390,466	3,681,276	367,523	8,179,161	670,741
Africa	684,456	62,534	886,553	83,003	2,640,214	224,767

Countries.	1903		1904		1905	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Europe:						
Austria-Hungary	450	$25	284	$36	....	....
Azores, and Madeira Islands	....	....	48	5	284	$41
Belgium	788	73	480	53	9,760	1,019
Denmark	80	8	100	8	....	....
France	2,400	260	4,800	600	21,985	2,262
Germany	32,268	2,470	18,790	1,747	1,210	123
Italy	1,120	114	5,232	556	5,700	465
Netherlands	1,072	124	4,072	414	3,250	349
Norway [d]	96	10	1,440	150	....	....
Spain	3,108	316	1,400	140	2,700	249
Sweden [d]	....	....	70	7	96	10
Switzerland	240	24	....	....	....	....
United Kingdom	35,369,196	3,121,774	33,555,080	3,506,102	21,026,108	1,872,992
North America:						
Dominion of Canada	....	....	....	....	290,850	21,121
Nova Scotia, New Brunswick, etc	....	....	49	4	....	....
Quebec, Ontario, Manitoba, etc	43,107	5,171	153,097	9,558	....	....
British Columbia	3,246,082	287,212	1,085,370	95,021	....	....
Newfoundland and Labrador	....	....	....	....	240	25
Mexico	356,951	26,787	538,949	38,691	493,371	40,597
Central American States—						
British Honduras	24,187	2,316	28,044	2,534	28,959	2,514
Costa Rica	36,806	3,073	58,828	4,668	93,580	8,179
Guatemala	3,527	296	15,732	1,131	20,498	1,583
Honduras	7,455	716	12,428	1,090	14,434	1,221
Nicaragua	20,089	1,771	28,159	2,394	42,108	3,146
Panama [e]	....	....	18,466	1,671	112,330	9,211
Salvador	3,360	282	4,304	326	2,296	184
Bermuda	64,264	6,792	36,022	3,778	32,931	3,634

[a] Guam was annexed to the United States in 1898.
[b] Hawaii was annexed to the United States in 1898.
[c] Tutuila was acquired in 1898.
[d] Sweden and Norway separated in 1905.
[e] Panama separated from Colombia in 1903.

EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915—Continued.

Countries.	1903		1904		1905	
	Pou..ds.	Value.	Pounds.	Value.	Pounds.	Value.
North America—Continued.						
West Indies—						
British	418,636	$38,434	409,219	$37,389	386,747	$34,262
Danish	9,647	903	7,442	752	9,474	965
Dutch	22,981	2,490	17,878	1,999	13,051	1,419
French	892	92	984	86	660	64
Haiti	2,495	238	2,115	228	1,611	164
Dominican Republic	3,290	335	7,660	719	4,855	482
Cuba	21,636	1,789	24,677	2,324	36,903	3,373
South America:						
Argentina	72,445	6,808	66,275	6,612	120,586	11,263
Bolivia	384	40	672	80	170	17
Brazil	88,740	8,451	114,083	11,742	188,342	17,908
Chile	1,044,490	89,354	1,218,286	72,205	821,171	66,160
Colombia	149,272	11,194	118,269	10,104	81,229	7,401
Ecuador	45,126	3,115	59,266	4,041	121,894	7,941
Guiana—						
British	172,300	16,829	112,360	11,226	135,424	13,617
Dutch	52,138	4,959	78,464	8,280	45,231	4,797
French	18,752	1,805	11,169	1,307	11,684	1,228
Peru	89,440	7,309	214,982	15,530	151,832	11,369
Uruguay	2,140	185	2,246	225	3,250	325
Venezuela	20,967	1,839	59,857	5,961	28,005	2,826
Asia and Oceania:						
Aden					2,520	180
Chinese Empire	166,822	13,602	218,142	18,770	249,386	17,587
China—Russian	53,366	5,111	40,000	3,932		
Hongkong	814,008	56,225	160,367	11,870	518,423	36,636
Japan	13,536	1,015	11,817,343	841,461	2,437,484	162,894
Korea	2,152	179	3,888	292	2,572	186
Russia, Asiatic	48	4	482	41		
Siam					384	31
East Indies—						
British	473,740	39,367	636,320	44,669	673,897	55,899
French					720	69
Dutch	235,680	19,256	119,216	9,018	109,476	7,893
All other Asia	240	24	10	1		
British Australasia	4,268,652	360,720	3,136,728	290,307	4,075,094	369,518
British Oceania	36,018	2,290	28,670	1,941	42,624	3,645
French Oceania	153,696	12,179	185,846	15,306	133,204	11,414
German Oceania	451,824	26,614	340,464	19,326	324,888	20,651
Philippine Islands	601,324	42,703	206,896	14,970	681,636	42,700
Africa:						
British Africa	1,454,226	127,921	794,758	77,911	1,259,209	121,120
Canary Islands	144	15			900	90
French Africa	2,220	207	3,200	320	4,500	450
Liberia	384	41	140	14	140	14
Portuguese Africa	167,964	17,043	137,640	13,906	200,826	20,365
Turkey in Africa—Egypt			388	30	2,448	204
All other Africa	5,200	506				
Total	50,353,334	4,350,791	55,924,278	5,224,598	35,006,555	3,035,469
RECAPITULATION.						
Europe	35,410,766	3,125,197	33,591,895	3,508,518	21,071,263	1,877,509
North America	4,255,406	378,666	2,446,023	204,363	1,565,773	132,134
South America	1,756,214	121,918	2,055,859	147,333	1,708,828	134,941
Asia	1,750,294	134,788	12,995,768	900,064	3,994,862	280,704
Oceania	5,511,514	444,505	3,898,605	341,849	5,257,446	467,928
Africa	1,630,138	145,733	936,126	92,151	1,466,383	142,253

Countries.	1906		1907		1908	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Europe:						
Austria-Hungary	1,260	$125	1,220	$112		
Azores, and Madeira Islands			863	89		
Belgium	500	60				
Denmark	40,200	4,112				
France	28,980	3,000			10,575	$961
Germany	4,896	420	9,150	976	45,977	4,573
Italy	4,920	413	10,280	861		
Malta, Gozo, etc.	420	38				

EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915—Continued.

Countries.	1906		1907		1908	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Europe—Continued.						
Netherlands	8,280	$869	11,098	$850		
Norway	40,200	3,981			17,670	$1,800
Portugal					7,577	731
Spain	1,930	193	3,206	303	27,900	2,735
Sweden	10,000	1,050			10,500	1,000
United Kingdom	31,918,816	2,739,284	7,720,991	788,245	13,200,887	1,193,516
North America:						
Dominion of Canada	236,664	14,814	793,267	65,356	7,320	587
Mexico	699,002	56,747	877,989	73,583	1,068,824	94,278
Central American States—						
British Honduras	43,155	3,639	36,020	3,214	32,632	3,080
Costa Rica	106,879	8,968	148,157	12,260	138,421	12,200
Guatemala	26,925	1,989	31,243	2,525	29,777	3,319
Honduras	15,148	1,319	22,508	2,068	32,965	3,202
Nicaragua	39,949	3,022	41,106	3,325	27,721	2,302
Panama	308,624	26,965	443,687	38,643	487,079	46,883
Salvador	2,880	197	4,092	331	5,854	467
Bermuda	24,679	2,406	29,139	2,711	26,183	2,579
West Indies—						
British	471,814	42,368	515,664	46,510	687,620	64,275
Danish	9,713	1,011	13,326	1,340	15,604	1,658
Dutch	11,643	1,230	24,275	2,428	21,368	2,234
French	200	20	100	9	96	11
Haiti	3,953	291	914	91	864	85
Dominican Republic	11,688	1,137	9,278	891	13,887	1,371
Cuba	57,441	5,823	60,904	5,855	57,970	5,288
South America:						
Argentina	200,206	20,289	262,667	25,801	294,306	30,759
Bolivia	1,720	181	18,951	1,577	11,762	1,217
Brazil	188,278	18,975	150,592	14,880	146,828	14,056
Chile	4,462,147	154,396	4,168,876	298,229	4,196,060	295,194
Colombia	51,967	4,667	41,964	3,830	51,786	4,880
Ecuador	80,876	5,858	203,980	15,599	174,920	12,486
Guiana—						
British	120,016	12,391	116,120	12,203	140,514	16,014
Dutch	65,654	6,248	66,530	6,494	59,380	6,063
French	12,650	1,306	17,950	1,829	23,218	2,599
Peru	269,858	20,342	551,160	40,431	316,701	22,229
Uruguay	10,436	1,075	16,124	1,546	17,984	1,693
Venezuela	35,775	3,280	44,828	4,336	37,583	3,564
Asia and Oceania:						
Aden	480	50				
Chinese Empire	32,189	2,331	59,110	4,386	23,126	2,154
Hongkong	105,581	7,652	122,482	9,960	144,626	13,367
Japan	9,061	713	22,881	1,775	2,472	289
Korea	1,632	128	1,500	129	1,156	128
Russia, Asiatic	1,440	103	770	84	582	65
Siam			1,440	90	3,264	292
Turkey in Asia	750	90			290	30
East Indies—						
British	477,234	38,263	1,043,618	75,001	702,169	59,254
French	16,262	1,163			720	75
Dutch	134,796	9,692	167,590	13,940	126,168	11,286
British Australasia	5,230,076	426,514	5,451,378	462,648	3,654,756	330,029
British Oceania	11,952	923	40,080	2,958	14,660	1,278
French Oceania	125,998	10,274	137,472	11,494	155,608	15,732
German Oceania	214,920	14,503	156,939	11,267	105,686	8,345
Philippine Islands	757,400	56,743	933,288	63,838	1,171,824	84,532
Africa:						
British Africa	1,029,757	87,881	504,848	47,748	454,892	43,883
Canary Islands	782	76	144	17		
French Africa	144	14			48	6
German Africa			600	60		
Liberia					5,079	482
Portuguese Africa	161,178	16,001	104,837	10,307	83,640	8,325
Turkey in Africa—Egypt	2,400	200				
Total	45,944,414	3,847,943	25,218,105	2,183,049	28,226,045	2,438,518
RECAPITULATION.						
Europe	32,061,402	2,753,643	7,736,730	791,436	13,321,086	1,205,375
North America	2,069,357	171,946	3,052,658	261,138	2,654,175	242,879
South America	3,499,603	249,062	5,659,690	414,774	5,571,000	410,743
Asia	779,415	60,173	1,419,391	105,364	1,004,571	86,908
Oceania	6,340,346	509,257	6,719,157	552,206	5,131,554	439,917
Africa	1,194,291	103,872	610,429	58,132	543,659	52,696

EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915—Continued.

Countries.	1909		1910	
	Pounds.	Value.	Pounds.	Value.
Europe:				
Azores, and Madeira Islands			100	$12
Denmark	192	$18		
France			1,578	223
Germany	17,096	1,757	424	51
Italy	5,148	500		
Netherlands	11,612	1,017	9,744	1,020
Russia on Baltic and White Seas	2,050	206	11,580	1,210
Spain	3,160	311	5,100	506
Sweden	20,000	1,940		
United Kingdom	22,969,218	2,201,446	44,737,072	4,709,160
North America:				
Dominion of Canada	229,934	21,773	99,022	7,570
Mexico	756,082	55,124	697,217	50,782
Central American States—				
British Honduras	35,195	3,261	28,310	2,606
Costa Rica	118,266	9,828	157,946	12,237
Guatemala	13,957	1,117	16,821	1,361
Honduras	14.112	1,179	16,240	1,361
Nicaragua	21,534	1,656	28,116	2,066
Panama	528,228	50,940	482,717	45,404
Salvador	9,184	754	5,498	423
Bermuda	23,774	2,461	28,484	2,383
West Indies—				
British	358,114	36,644	548,561	53.939
Danish	14,848	1,568	14,055	1,512
Dutch	16,021	1,883	9,838	1,160
French	564	69	196	18
Haiti	2,184	203	2,038	185
Dominican Republic	13,258	1,306	22,120	2,058
Cuba	53,580	5,277	68,737	6,486
South America:				
Argentina	259,192	17,030	229,461	15,690
Bolivia	6,184	647	33,502	2,941
Brazil	176,150	17,109	297,354	28,241
Chile	97,993	6,918	1,556,620	92,250
Colombia	58,518	5,767	114,274	9,494
Ecuador	139,868	10,952	272,411	16,487
Guiana—				
British	255,039	25,561	222,398	22,133
Dutch	100,259	9,906	57,509	6,207
French	22,816	2,164	17,724	1,784
Peru	295,885	22,640	807,676	64,817
Uruguay	15,140	1,330	11,780	1,167
Venezuela	34,618	3,058	43,144	4,887
Asia and Oceania:				
Chinese Empire	53,448	4,887	22,522	2,088
China—British leased territory			3,120	345
Hongkong	103,448	9,707	121,558	12,234
Japan	15,078	1,245	3,716	332
Korea	2,652	206	2,016	220
Russia, Asiatic	5,380	394		
Siam	14,880	1,025	1,008	93
East Indies—				
British	989,592	85,094	1,246,751	101,619
French	528	56		
Dutch	201,696	16,908	189,604	15,920
All other Asia			480	45
British Australasia	5,704,960	500,094	5,474,818	551,312
British Oceania	109,936	7,437	66,826	5,160
French Oceania	162,336	14,570	241,280	22,589
German Oceania	279,792	18,311	300,576	22,554
Philippine Islands	1,126,470	74,792	5,425,404	396,604
Africa:				
British Africa	484,196	46,220	357,061	37,707
Canary Islands	510	51		
German Africa	350	36	910	92
Portuguese Africa	162,314	14,604	151,470	14,674
Turkey in Africa—Egypt			1,440	120
Total	38,117,109	3,416,436	63,860,696	6,314,258
RECAPITULATION.				
Europe	23,028,476	2,207,194	44,765,898	4,712,182
North America	2,209,405	198,043	2,224,516	191.551
South America	1,461,662	123,502	3,198,812	226,197
Asia	1,286,702	119,582,	1,596,775	133,516
Oceania	7,383,494	705,204	11,508,824	998,219
Africa	647,370	62,911	510,871	52,593

EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915—Continued.

Countries.	1911		1912		1913	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Europe:						
Belgium	....	....	48,000	$4,000	13,000	$940
Denmark	....	....	134,871	13,484	186,996	17,485
Finland	12,000	$1,170	....	....	2,400	250
France	....	....	480	58	33,120	2,710
Germany	1,240	163	193,341	16,160	41,929	3,688
Gibraltar	....	....	....	....	2,400	250
Italy	....	....	....	....	720	75
Malta, Gozo, etc	....	....	....	....	9,600	732
Netherlands	....	....	240	35	9,456	1,005
Norway	....	....	....	....	250	26
Portugal	....	....	400	46	....	....
Russia in Europe	....	....	1,700	175	....	....
Spain	10,000	802	2,085	216	1,300	124
Sweden	....	....	96	10	....	....
United Kingdom—						
England	22,110,988	2,406,573	10,148,107	2,148,828	25,076,343	2,674,626
Scotland	....	....	16,400	1,470	30,640	3,333
North America:						
Bermuda	19,348	2,242	32,648	3,549	58,892	5,633
British Honduras	45,396	4,478	25,980	2,873	27,153	2,768
Canada	53,828	4,470	353,309	33,159	992,053	105,818
Central American States—						
Costa Rica	152,101	14,215	205,304	19,989	100,964	7,627
Guatemala	23,606	2,417	38,925	4,056	53,991	4,162
Honduras	22,321	2,194	37,818	4,194	34,212	3,146
Nicaragua	61,096	6,173	70,702	6,981	128,597	9,185
Panama	318,672	30,866	398,612	43,371	587,909	48,959
Salvador	7,704	847	9,808	1,154	17,126	1,373
Mexico	663,681	59,465	1,454,580	126,612	1,427,853	102,853
West Indies—						
British—						
Barbados	48,361	5,028	84,207	8,884	32,303	3,542
Jamaica	94,259	9,987	266,972	28,207	288,243	26,107
Trinidad and Tobago	189,193	19,114	202,657	22,876	169,123	17,743
Other British	136,207	14,273	45,805	5,360	51,239	5,865
Cuba	78,814	7,817	109,953	11,462	160,933	13,281
Danish	14,180	1,414	8,661	1,020	6,716	742
Dutch	18,928	2,136	22,429	2,513	27,464	2,811
French	1,257	118	904	97	270	28
Haiti	3,058	358	10,818	1,213	12,765	1,210
Dominican Republic	27,890	3,086	43,089	4,161	94,393	7,975
South America:						
Argentina	217,994	18,828	986,832	89,468	110,404	9,984
Bolivia	32,908	3,500	102,574	9,466	43,648	2,329
Brazil	317,809	35,171	151,717	17,348	219,492	22,899
Chile	1,491,089	121,833	3,986,595	345,295	2,318,720	143,574
Colombia	100,311	10,467	191,535	18,600	173,760	13,018
Ecuador	228,948	18,018	294,280	26,498	293,175	17,787
Guiana—						
British	118,034	13,935	152,479	16,868	214,340	22,438
Dutch	85,909	8,827	135,514	15,143	69,223	6,578
French	15,976	1,604	18,820	2,235	21,178	1,606
Paraguay	....	....	648	72	....	....
Peru	295,235	24,170	589,285	51,855	513,311	34,129
Uruguay	12,940	1,294	18,897	2,202	8,633	883
Venezuela	89,774	9,796	127,264	14,243	148,878	17,222
Asia:						
Aden	....	....	....	....	240	21
China	22,188	2,867	33,504	4,340	83,568	6,700
China, leased territory—						
Japanese	....	....	....	....	192	22
Chosen	1,536	208	1,488	223	13,200	1,011
East Indies—						
British—						
British India	107,376	10,423	171,090	17,177	550,694	38,069
Straits Settlements	1,077,096	104,931	787,020	67,317	1,635,282	116,365
Other British	43,104	4,447	73,632	7,180	143,865	8,962
Dutch	171,840	17,937	253,026	24,813	356,448	31,084
French	96	8	....	....	....	....
Hongkong	61,650	7,362	144,552	17,115	767,810	49,360
Japan	3,072	347	235,114	21,667	2,256	289
Russia in Asia	....	....	1,440	144	....	....
Siam	960	147	960	143	39,360	2,209
Turkey in Asia	364	44	....	....	632	58

EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915—Continued.

Countries.	1911		1912		1913	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Oceania:						
British—						
Australia and Tasmania	5,812,096	$587,854	5,494,218	$765,678	6,331,184	$764,379
New Zealand	137,088	13,791	79,924	9,569	194,836	20,377
Other British	172,092	14,137	33,830	4,035	53,006	4,036
French	241,112	28,226	231,980	31,184	335,800	34,790
German	268,118	22,048	283,753	22,682	281,744	27,580
Philippine Islands	3,069,118	225,885	5,096,810	422,001	10,122,820	890,128
Africa:						
British Africa—						
West	....	....	200	25	9,400	1,020
South	213,538	23,488	630,653	64,582	376,977	31,170
Egypt	....	....	7,392	861	20,936	1,808
German Africa	1,710	293	2,700	290	2,830	306
Liberia	100	12	146	15	....	....
Portuguese Africa	48,490	4,611	145,738	13,409	52,460	5,029
Spanish Africa	26,850	2,229	650	76	800	85
Total	38,600,799	4,037,142	43,423,756	4,620,563	55,290,966	5,103,340
RECAPITULATION.						
Europe	22,134,328	2,408,708	19,545,720	2,183,982	25,408,154	2,705,254
North America	1,979,950	190,637	3,411,176	332,692	4,271,710	370,823
South America	3,006,927	266,903	6,756,440	609,381	4,134,771	292,367
Asia	1,480,282	148,721	1,702,426	160,119	3,593,538	254,209
Oceania	9,690,624	991,540	11,220,515	1,255,149	17,419,390	1,441,270
Africa	290,688	30,633	787,479	79,238	463,403	39,417

Countries.	1914		1915	
	Pounds.	Value.	Pounds.	Value.
Europe:				
Belgium	45,590	$3,024	92,088	$8,036
Denmark	75,093	6,110	858,128	80,918
France	14,400	1,443	14,775	1,388
Germany	85,738	4,870	....	....
Gibraltar	5,100	541	1,200	120
Greece	....	....	30	3
Italy	6,720	644	3,864	360
Malta, Gozo, etc	2,400	300	....	....
Netherlands	11,000	1,100	493,350	51,031
Norway	3,300	320	56,530	7,341
Portugal	....	....	700	68
Spain	3,795	365	34,080	3,670
Sweden	7,200	700	....	....
Turkey in Europe	1,500	150	600	57
United Kingdom—				
England	62,318,612	5,982,247	62,053,816	6,944,736
Scotland	274,080	23,906	144,000	13,000
Ireland	7,200	450	....	....
North America:				
Bermuda	43,346	3,986	62,493	5,936
British Honduras	31,486	3,430	28,392	3,071
Canada	3,632,465	314,917	2,118,806	168,487
Central American States—				
Costa Rica	149,848	10,247	54,846	4,960
Guatemala	46,171	3,744	17,183	1,656
Honduras	67,387	5,821	40,645	4,330
Nicaragua	50,497	3,880	20,656	1,940
Panama	367,678	31,350	397,172	41,209
Salvador	13,806	1,050	8,474	797
Mexico	754,172	53,665	636,649	53,816
Miquelon, Langley, etc	....	....	48	4
Newfoundland and Labrador	....	....	960	96
West Indies—				
British—				
Barbados	77,836	6,013	41,375	3,801
Jamaica	188,856	17,805	84,950	7,520
Trinidad and Tobago	175,590	16,171	201,685	21,681
Other British	73,274	7,158	68,507	7,795
Cuba	306,749	21,917	405,874	31,984
Danish	13,259	1,273	9,934	886
Dutch	34,511	3,131	25,855	2,809
French	894	95	1,773	162
Haiti	2,670	260	1,478	110
Dominican Republic	77,120	5,682	94,489	7,232

EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915—Continued.

Countries.	1914		1915	
	Pounds.	Value.	Pounds.	Value.
South America:				
Argentina	51,444	$4,472	185,826	$16,869
Bolivia	26,904	1,634	22,080	1,710
Brazil	80,129	7,211	28,799	2,883
Chile	2,123,237	134,678	326,579	22,734
Colombia	183,508	12,760	94,659	8,187
Ecuador	277,488	15,280	207,104	15,458
Guiana—				
British	132,455	13,444	110,516	11,752
Dutch	97,850	8,153	57,134	5,486
French	7,266	665	18,434	1,647
Peru	301,374	19,091	79,642	6,591
Uruguay	4,660	351	3,922	379
Venezuela	186,074	15,936	167,267	14,096
Asia:				
Aden	552	28	....	....
China	45,504	3,980	66,673	6,779
China, leased territory—				
British	1,920	200	....	....
Chosen	2,928	266	816	102
East Indies—				
British—				
British India	327,817	21,168	301,654	26,639
Straits Settlements	1,541,408	90,292	266,172	20,949
Other British	135,840	9,141	132,380	10,488
Dutch	331,776	22,408	309,154	26,815
French	624	43	2,400	220
Hongkong	480,036	32,109	47,472	4,567
Japan	2,614	274	5,000	518
Russia in Asia	144	13	470	56
Siam	480	60	3,552	502
Turkey in Asia	4,352	420	50	7
Oceania:				
British—				
Australia and Tasmania	5,961,723	666,703	7,367,824	957,058
New Zealand	95,136	9,289	118,032	13,780
Other British	73,984	5,168	36,050	3,524
French	389,424	37,218	223,008	24,139
German	534,484	33,247	295,920	22,327
Philippine Islands	5,034,252	266,369	4,059,580	288,548
Africa:				
British Africa—				
West	....	....	109,728	10,749
South	295,607	24,561	598,223	55,079
Canary Islands	....	....	542	66
Egypt	15,024	1,059	38,800	3,160
German Africa	2,860	306	....	....
Italian Africa	2,400	230	....	....
Liberia	....	....	4,820	412
Portuguese Africa	36,650	3,238	65,530	6,859
Spanish Africa	1,000	113	1,300	125
Total	87,750,920	7,999,293	83,446,116	9,072,083
RECAPITULATION.				
Europe	62,862,328	6,026,170	63,760,758	7,110,728
North America	6,907,615	511,545	4,328,246	370,444
South America	3,472,438	233,675	1,301,962	107,783
Asia	2,875,995	190,402	1,135,793	97,662
Oceania	12,089,063	1,017,994	12,100,414	1,309,378
Africa	353,541	29,507	818,943	76,430

The table following shows for the past 16 years the customs districts from which the canned salmon was exported. Up to 1910 about two-thirds of the total exports have gone from the port of San Francisco, while about one-fifth of the total passed through the port of Puget Sound, Wash. In 1910, however, the exports from Puget Sound exceeded those from San Francisco. The only other port through which any considerable quantity is shipped is New York

City. It is usual now to load the salmon on steamers and sailing vessels at San Francisco and the Puget Sound cities to go direct to Europe.

Exports, by Customs Districts, of Canned Salmon, 1900 to 1915.

Customs districts from which exported.	1900		1901		1902	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Atlantic ports:						
Baltimore, Md	648	$65	334,580	$33,053	324	$34
Bangor, Me	....	....	....	....	10	1
Boston and Charlestown, Mass	222,770	20,488	192,676	27,372	172,110	20,224
New York, N. Y	3,485,326	340,538	7,960,104	847,294	4,365,074	407,009
Philadelphia, Pa	110,500	9,100	77,000	9,050	....	....
Savannah, Ga	1,012	81	582	72	480	60
St. Johns, Fla	....	....	....	....	75	7
Norfolk and Portsmouth, Va	....	....	269,380	30,888	....	....
Charleston, S. C	400	30	....	....	....	....
Gulf ports:						
Key West, Fla	....	....	400	43	....	....
Mobile, Ala	10,536	958	7,340	816	11,032	1,055
New Orleans, La	28,332	2,472	47,685	4,567	39,084	3,910
Mexican border ports:						
Arizona	6,253	706	18,104	1,869	23,879	2,350
Brazos de Santiago, Tex	168	21	816	115	300	29
Paso del Norte, Tex	23,843	2,134	1,220	98	164,167	13,119
Pacific ports:						
Alaska	289	38	4,859	291	3,636	558
Hawaii	....	....	....	....	48	4
Puget Sound, Wash	1,477,232	144,059	2,271,306	282,441	9,864,259	872,912
San Diego, Cal	3,094	220	3,574	293	6,202	487
San Francisco, Cal	21,611,030	2,164,904	30,014,055	2,983,982	32,327,572	2,654,020
Willamette, Oreg	76,800	5,320	43,318	3,517	155,500	11,250
Northern border and Lake ports:						
Detroit, Mich	....	....	26,200	2,700	....	....
Minnesota, Minn	....	....	101	10	....	....
Vermont, Vt	120	12	....	....	....	....
Duluth, Minn	24,000	2,500	16,200	1,800	39,312	4,368
Memphremagog, Vt	17	2	....	....	50	5
Total	27,082,370	2,693,648	41,289,500	4,230,271	47,173,114	3,991,402
RECAPITULATION.						
Atlantic ports	3,820,656	370,302	8,834,322	947,729	4,538,073	427,335
Gulf ports	38,868	3,430	55,425	5,426	50,116	4,965
Mexican border ports	30,264	2,861	20,140	2,082	188,346	15,498
Pacific ports	23,168,445	2,314,541	32,337,112	3,270,524	42,357,217	3,539,231
Northern border and Lake ports	24,137	2,514	42,501	4,510	39,362	4,373

Customs districts from which exported.	1903		1904		1905	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Atlantic ports:						
Baltimore, Md	840	$92	490	$50	576	$62
Bangor, Me	....	....	121	9	294	26
Boston and Charlestown, Mass	104,750	12,266	2,400	215	....	....
New York, N. Y	5,627,654	599,393	2,129,523	214,016	2,653,775	286,599
Philadelphia, Pa	540	54	587	42	8,858	570
Providence, R. I	685	63	....	....	....	....
Gulf ports:						
Key West, Fla	....	....	1,500	125	400	23
Mobile, Ala	9,612	834	9,208	811	7,102	561
New Orleans, La	44,404	4,261	61,909	5,503	89,909	7,841
Tampa, Fla	....	....	180	16	....	....
Mexican border ports:						
Arizona	26,988	2,808	7,568	745	20,845	1,878
Brazos de Santiago, Tex	....	....	96	7	....	....
Paso del Norte, Tex	103,375	8,938	347,218	23,401	262,014	20,687
Saluria, Tex	....	....	366	30	6,580	583

EXPORTS, BY CUSTOMS DISTRICTS, OF CANNED SALMON, 1900 TO 1915—Continued.

Customs districts from which exported.	1903		1904		1905	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Pacific ports:						
Alaska	....	....	153,600	$9,550	4,848	$557
Hawaii	....	....	48	7	148	15
Puget Sound, Wash.	16,527,456	$1,549,319	19,706,003	1,655,666	4,444,562	226,485
San Diego, Cal.	5,897	421	5,678	422	3,504	259
San Francisco, Cal.	27,448,182	2,138,019	33,212,614	3,303,292	27,498,325	2,406,422
Willamette, Oreg.	409,444	29,142	224,549	10,628	5,775	531
Oregon, Oreg.	400	25	....	....	....	....
Northern border and Lake ports:						
Detroit, Mich.	....	....	580	58	....	....
North and South Dakota	....	....	20	2	....	....
Superior, Mich.	....	....	....	....	28,800	2,304
Vermont, Vt.	74	7	25	3	....	....
Duluth, Minn.	43,033	5,164	....	....	....	....
Total	50,353,334	4,350,791	55,924,278	5,224,598	35,006,555	3,035,409
RECAPITULATION.						
Atlantic ports	5,734,469	611,868	2,133,121	214,332	2,663,503	267,352
Gulf ports	54,016	5,085	72,792	6,455	97,561	5,425
Mexican border ports	130,363	11,741	355,248	24,183	259,439	25,148
Pacific ports	44,391,379	3,716,926	53,302,492	4,979,565	31,957,252	2,734,289
Northern border and Lake ports	43,107	5,171	625	63	28,800	2,304

Customs districts from which exported.	1906		1907		1908	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Atlantic ports:						
Baltimore, Md.	196	$21	156	$28	301	$37
New York, N. Y.	3,275,875	318,128	2,313,335	227,646	2,332,392	226,850
Philadelphia, Pa.	1,400	159	722	67	720	71
Portland and Falmouth, Me.	100	13	....	....	....	....
St. Johns, Fla.	....	....	322	38	1,250	155
Gulf ports:						
Galveston, Tex.	60	8	40,213	3,216	292	23
Key West, Fla.	890	94	312	25	190	18
Mobile, Ala.	38,267	3,031	11,675	992	10,823	1,051
New Orleans, La.	88,014	7,775	112,850	10,217	194,711	18,144
Sabine, Tex.	....	....	....	....	104	9
Tampa, Fla.	24	2	....	....	....	....
Mexican border ports:						
Arizona	45,883	4,128	34,479	3,268	43,035	3,836
Corpus Christi, Tex.	....	....	....	....	30,930	2,775
Paso del Norte, Tex.	387,568	30,336	513,202	42,548	626,837	56,167
Saluria, Tex.	21,962	1,666	22,662	1,960	22,887	2,341
Pacific ports:						
Alaska	....	....	305,294	33,315	790	99
Hawaii	....	....	....	....	144	14
Los Angeles, Cal.	540	53	....	....	....	....
Puget Sound, Wash.	17,288,980	1,499,819	9,340,000	845,982	6,351,440	528,558
San Diego, Cal.	4,228	331	8,456	661	6,994	567
San Francisco, Cal.	24,612,868	1,969,214	12,502,876	1,012,199	18,601,705	1,597,735
Willamette, Oreg.	540	55	3,723	241	100	23
Northern border and Lake ports:						
Huron, Mich.	177,734	13,107	7,000	570	....	....
Minnesota, Minn.	....	....	48	5	....	....
Oswegatchie, N. Y.	....	....	780	71	400	46
Vermont, Vt.	35	3	....	....	....	....
Total	45,944,414	3,847,943	25,218,105	2,183,049	28,226,045	2,438,518
RECAPITULATION.						
Atlantic ports	3,277,571	318,321	2,314,535	227,779	2,334,663	227,113
Gulf ports	127,255	10,910	165,050	14,450	206,120	19,245
Mexican border ports	455,413	36,130	570,343	47,776	723,689	65,119
Pacific ports	41,906,406	3,469,472	22,160,349	1,892,398	24,961,173	2,126,995
Northern border and Lake ports	177,769	13,110	7,828	646	400	46

EXPORTS, BY CUSTOMS DISTRICTS, OF CANNED SALMON, 1900 TO 1915—Continued.

Customs districts from which exported.	1909		1910	
	Pounds.	Value.	Pounds.	Value.
Atlantic ports:				
Baltimore, Md	192	822	36	3
Bangor, Me	216	25		
Boston and Charlestown, Mass	162,024	16,857	3,000	280
New York, N. Y	3,848,870	390,268	2,999,480	305,732
Philadelphia, Pa	405	44	700	89
Norfolk and Portsmouth, Va	32,100	2,739		
Perth Amboy, N. J			214	18
Gulf ports:				
Galveston, Tex	876	88	155	12
Key West, Fla	40	4	340	27
Mobile, Ala	13,565	1,247	14,018	1,322
New Orleans, La	92,537	7,615	103,980	8,187
Tampa, Fla			66	6
Mexican border ports:				
Arizona	27,735	2,733	54,425	4,612
Brazos de Santiago, Tex	138	13	641	64
Corpus Christi, Tex	26,220	2,450	27,365	2,414
Paso del Norte, Tex	150,636	14,850	125,169	11,560
Saluria, Tex	14,399	1,528	47,117	2,853
Pacific ports:				
Alaska	66,090	6,263		
Los Angeles, Cal	13,370	934	9,229	820
Puget Sound, Wash	7,858,582	716,370	22,406,617	3,331,174
San Diego, Cal	5,546	460	6,355	563
San Francisco, Cal	23,761,556	2,247,957	28,027,911	2,041,608
Willamette, Oreg			78	11
Northern border and Lake ports:				
Detroit, Mich	42,000	3,990		
North and South Dakota	12	1		
Duluth, Minn			33,200	2,800
Montana and Idaho			600	83
Total	36,117,109	3,416,435	53,860,696	5,314,258
RECAPITULATION.				
Atlantic ports	4,043,807	409,932	3,003,430	306,122
Gulf ports	107,018	8,954	118,559	9,554
Mexican border ports	219,128	21,574	254,717	21,503
Pacific ports	31,705,144	2,971,984	50,450,190	5,074,196
Northern border and Lake ports	42,012	3,991	33,800	2,883

Customs districts from which exported.	1911		1912	
	Pounds.	Value.	Pounds.	Value.
Atlantic ports:				
Baltimore, Md	63	810	13	94
Bangor, Me	96	11		
Boston and Charlestown, Mass			24	5
Jacksonville, Fla			48	8
New York, N. Y	1,563,285	166,819	2,505,950	257,647
Perth Amboy, N. J	440	42	690	97
Philadelphia, Pa	601	59	264	31
Gulf ports:				
Galveston, Tex	48	4		
Key West, Fla	232	28		
Mobile, Ala	19,512	1,873	5,313	515
New Orleans, La	130,567	13,284	103,732	11,514
Mexican border ports:				
Arizona	21,915	2,180	23,631	2,052
Brazos de Santiago, Tex	554	48		
Corpus Christi, Tex	32,863	3,232	64,114	6,962
Paso del Norte, Tex	131,258	12,438	275,768	25,297
Saluria, Tex	26,696	2,495	51,746	4,144
Pacific ports:				
Alaska			351,552	33,958
Hawaii	24	4	24	5
Los Angeles, Cal	3,148	308		
Portland, Oreg	1,730	183	1,093,200	109,295
Puget Sound, Wash	10,022,314	1,043,813	19,327,026	1,806,541
San Diego, Cal	9,055	820	17,047	1,585
San Francisco, Cal	26,027,458	2,780,506	19,591,609	2,301,782

Exports, by Customs Districts, of Canned Salmon, 1900 to 1915—Continued.

Customs districts from which exported.	1911		1912	
	Pounds.	Value.	Pounds.	Value.
Northern border and Lake ports:				
Superior, Mich			1,405	$171
Total	38,600,709	$4,037,142	43,423,756	4,620,563
RECAPITULATION.				
Atlantic ports	1,564,485	166,971	2,506,989	257,702
Gulf ports	159,350	15,194	109,045	12,029
Mexican border ports	213,226	20,303	415,259	38,455
Pacific ports	36,663,729	3,834,584	40,891,058	4,312,116
Northern border and Lake ports			1,405	171

Customs districts from which exported.	1913		1914		1915	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
New York	1,935,881	$189,959	2,404,220	$207,924	5,316,456	$512,540
New Orleans			182,717	19,787	261,709	28,682
El Paso			120,140	9,045	176,390	12,348
San Francisco	31,687,774	3,277,841	38,844,912	3,600,636	35,321,058	4,209,914
Oregon	624,000	83,000	124,512	9,391	671,452	64,517
Washington	19,827,745	1,434,451	45,876,703	4,128,449	41,064,868	4,183,410
All other districts	1,215,506	118,069	197,716	14,061	634,183	60,663
Total	55,290,966	5,103,340	87,750,920	7,999,293	83,446,116	9,072,083

EXPORTS OF FRESH AND CURED SALMON.

The following table shows, by countries, the value of the exports of fresh and cured salmon for the period 1900 to 1914, inclusive. As with the canned salmon, the greater part of these exports go to European countries, Germany taking by far the largest quantity. A small portion of this is salmon caught in eastern waters.

Exports, by Countries Receiving, of Domestic Pickled, Fresh, etc., Salmon, 1900 to 1914.

Exported to—	1900	1901	1902	1903	1904	1905
Europe:						
Azores, and Madeira Islands	$3				$123	$85
Belgium		$1,062	$38		4,750	
Denmark	378	15,285	16,904	$653	2,315	22,952
France	180	300			57	
Germany	300,291	320,369	470,657	741,634	1,061,944	1,666,787
Greece						158
Italy						100
Malta, Goso, etc	475	55	280	28		
Netherlands	50	184	3,023	4,127	3,105	300
Norway				12,765	12,285	7,896
Russia in Europe	300					2,574
Spain						56
Sweden	7	5,595	5,065		1,838	17,776
United Kingdom	38,959	1,528		990	8,523	20,255
North America:						
Bermuda	88	14	11	21		246
British Honduras	7	9		22	120	94
Dominion of Canada—						
Nova Scotia, New Brunswick, etc					418	3
Quebec, Ontario, Manitoba, etc	1,516	2,555	1,051	6,083	3,572	7,498
British Columbia	80,652	53,922	125,916	53,592	25,913	16,299

EXPORTS, BY COUNTRIES RECEIVING, OF DOMESTIC PICKLED, FRESH, ETC., SALMON, 1900 TO 1915—Continued.

Exported to—	1900	1901	1902	1903	1904	1905
North America—Continued.						
Central American States—						
Costa Rica	$220	$703	$218	$178	$340	$192
Guatemala			27	11	1	208
Honduras		5		1	2	25
Nicaragua	53	25	40	78	40	75
Panama					167	315
Salvador		22		7		
Mexico	1,330	664	1,925	1,397	1,266	1,136
West Indies—						
British	943	939	2,348	5,150	2,867	4,999
Cuba	429	376	273	114	194	182
Danish	12	31	38	84	13	67
Dutch	195	167	293	177	197	225
French	126	122	315	199	273	100
Haiti	181	191	164	84	11	124
Porto Rico	1,214					
Dominican Republic	998	670	85	57	14	28
South America:						
Argentina					143	1,641
Bolivia			1,200			
Brazil	172	33	419	285	227	1,100
Chile	143			70	164	
Colombia	416	228	657	441	17	
Ecuador			65			15
Guiana—						
British	30	82	30	262	60	161
Dutch	400	226	286	11	786	176
French	420	290	134	434	251	65
Peru	25		27	62	194	112
Venezuela	98	42	245	25		106
Asia:						
Chinese Empire		400	25	9	84	201
China—Russian				15		
East Indies—						
British		121	71	30	115	135
Dutch					275	
Hongkong	507		519	1,840	402	4,797
Japan	2,807	14,516	25,228	3,499	476	25,037
Russia—Asiatic	10					
Oceania:						
British Australasia	39,867	618	23,785	31,503	25,206	21,596
All other British Oceania			346	29	27	22
French Oceania	1,958	1,729	1,325	1,877	1,838	2,290
German Oceania			13	948	977	861
Guam	57	3,420				
Hawaii	58,870					
Philippine Islands			384	478	18	308
Tonga, Samoa, and all other	636	215				
Tutuila			10			
Africa:						
British Africa—						
West			304			
South	170	24	21	12	859	114
French Africa	85					
Liberia					5	
Total	535,276	426,738	694,435	869,352	1,163,489	1,832,686
RECAPITULATION.						
Europe	340,643	344,368	496,637	760,197	1,094,960	1,749,029
North America	87,964	60,416	132,704	67,225	36,406	25,809
South America	1,709	901	3,063	1,690	1,842	3,438
Asia	3,324	15,037	25,843	5,393	1,352	30,170
Oceania	101,388	5,982	25,863	34,835	28,063	25,065
Africa	255	24	325	12	864	114

EXPORTS, BY COUNTRIES RECEIVING, OF DOMESTIC PICKLED, FRESH, ETC., SALMON, 1900 TO 1915—Continued.

Exported to—	1906	1907	1908	1909	1910
Europe:					
Azores, and Madeira Islands		$95			
Belgium	$114			$410	
Denmark	36,623	108,269	$90,015	81,196	$83,649
France		150		230	415
Germany	1,670,366	1,601,166	1,422,846	1,038,580	1,223,558
Italy	137				
Netherlands	793	204	2,947		
Norway	9,303	11,390	22,104	22,917	45,853
Portugal		1,650			
Russia in Europe		140		14,735	5,260
Spain		55		258	
Sweden	32,554	23,460	21,540	23,670	42,725
United Kingdom	26,196	48,237	28,083	43,952	66,555
North America:					
Bermuda	173	20	23	68	680
British Honduras	14		1,036		
Dominion of Canada—Nova Scotia, New Brunswick, etc	32,925	18,785	16,964	21,973	23,559
Central American States—					
Costa Rica	46	213	189	217	197
Guatemala	40		902	18	63
Honduras		92	2,451		
Nicaragua	39	27	1,317	31	11
Panama	380	2,211	1,878	175	775
Mexico	1,231	528	460	199	555
West Indies—					
British	1,646	205	975	4,890	3,067
Cuba	128	371	104	121	97
Danish	30	106	39	165	42
Dutch	94	98		49	78
French		16	19	14	19
Haiti	97	277	675	335	263
Dominican Republic	100	255	226	128	313
South America:					
Argentina	85	500			
Brazil	308			120	3,029
Chile	15	20	56		
Colombia	105	67	90	22	167
Ecuador		391		290	
Guiana—					
British	218	5	48	76	823
Dutch	287	133	130	271	217
French	57	36	75	21	695
Peru	1,317	1,163	118	555	
Venezuela	208	36			311
Uruguay				10	
Asia:					
Chinese Empire	3,391	293	170	41	86
East Indies—					
British	63		66	18	60
Dutch					41
Hongkong	1,339	687	13	809	10
Japan	88,068	18,395	3,592	2,772	90
Korea		3			3
Russia—Asiatic		6	121		
Turkey in Asia					55
Oceania:					
British Australasia	15,169	23,186	26,591	25,466	22,836
All other British Oceania	21		11		89
French Oceania	2,154	2,136	1,792	1,528	1,896
German Oceania	749	1,112	373	1,229	1,139
Philippine Islands	821	12,287		712	2,089
Africa:					
British Africa—South	20				1,268
Liberia	40				
Portuguese Africa			198		
Spanish Africa				289	
Total	1,927,464	1,878,743	1,648,044	1,288,560	1,532,640
RECAPITULATION.					
Europe	1,776,086	1,794,885	1,587,535	1,225,948	1,468,015
North America	36,943	23,204	27,263	28,383	29,668
South America	2,600	2,351	517	1,365	5,242
Asia	92,861	19,384	3,962	3,640	345
Oceania	18,914	38,721	28,767	28,935	28,079
Africa	60	198		289	1,268

EXPORTS, BY COUNTRIES RECEIVING, OF DOMESTIC PICKLED, FRESH, ETC., SALMON, 1900 TO 1915—Continued.

Exported to—	1911	1912	1913	1914	1915
Europe:					
Austria-Hungary				875	
Belgium			8720		65
Denmark	865,472	672,961	58,494	84,727	717,187
Finland	16,515	15,608	12,582	15,395	2,840
France	150	4,437	400	3,051	695
Germany	1,220,055	1,358,545	1,857,800	1,837,624	100,899
Greece					300
Italy					10,000
Netherlands	1,267		2,930	7,550	
Norway	14,437	27,953	23,516	38,580	415,080
Russia in Europe		130			
Sweden	33,382	49,090	44,625	34,212	42,490
United Kingdom—England	59,906	55,980	60,153	49,888	78,374
North America:					
Bermuda	94	332		324	128
British Honduras	807			276	
Canada	20,539	17,487	31,583	32,742	15,408
Central American States—					
Costa Rica	98	91	227	127	84
Guatemala	111	12	7	16	90
Honduras	179				
Nicaragua	347	18	10	2	9
Panama	196	167	1,009	385	1,544
Salvador		28		22	41
Mexico	21	319	450	584	250
Miquelon, Langley, etc.					16
Newfoundland and Labrador					17
West Indies—					
British—					
Barbados	956		250		520
Jamaica	7		3	41	176
Trinidad and Tobago	135		45	253	576
Other British	41	110			17
Cuba	778	138	457	233	687
Danish			123	47	16
Dutch	34	81		86	136
French		124	49		
Haiti	731	800	16	385	154
Dominican Republic	304	678	528	551	507
South America:					
Bolivia			30		
Brazil	225	80	173		95
Chile	2		14	258	
Colombia	71	42	3,162		27
Ecuador				100	15
Guiana—					
British	28			470	
Dutch				78	140
French			16		7
Peru	24		14		290
Venezuela	34	19		16	44
Asia:					
China	200	21	30	122	8
China, leased terr.—Japanese					290
Chosen	8	45	25	20	3
East Indies—British—					
British India		31	523	20	
Other British	7				
Hongkong	1,330		779	1,980	9
Japan	2,280	10	33	202	370
Russia in Asia					50
Turkey in Asia					102
Oceania:					
British—					
Australia and Tasmania	23,838	14,682	17,972	26,559	25,271
New Zealand	1,101	128	2,795	364	201
Other British	335	67	49	74	117
French	1,834	2,241	1,222	1,425	1,012
German	1,694	2,028	1,727	727	494
Philippine Islands	3,542	2,437	1,934	2,181	325
Africa:					
British Africa—					
South		4	1,210		
East	424				
Egypt				32	
French Africa			1,000		
Total	1,573,139	1,630,151	2,122,566	2,195,309	1,424,859

EXPORTS, BY COUNTRIES RECEIVING, OF DOMESTIC PICKLED, FRESH, ETC., SALMON, 1900 TO 1915—Continued.

Exported to—	1911	1912	1913	1914	1915
RECAPITULATION.					
Europe	$1,511,184	$1,587,973	$2,055,109	$2,074,499	$1,375,128
North America	24,880	20,350	34,741	86,087	20,336
South America	384	142	3,400	933	618
Asia	3,933	107	1,398	2,428	1,362
Oceania	32,334	21,575	25,699	31,330	27,420
Africa	434	4	2,210	33	....

The exports of domestic fresh and cured salmon from 1900 to 1915, inclusive, are shown below, by customs districts. The greater part of the shipments pass through the New York City customs district:

EXPORTS, BY CUSTOMS DISTRICTS, OF DOMESTIC PICKLED, FRESH, ETC., SALMON, 1900 TO 1915.

Customs districts from which exported.	1900	1901	1902	1903	1904	1905
Atlantic ports:						
Baltimore, Md	....	....	$158	....	....	$8
Bangor, Me	....	....	....	....	....	3
Belfast, Me	$12	$17	12	$19	$7	....
Boston and Charlestown, Mass	16	....	34	52	418	....
New York, N. Y	346,853	330,805	503,219	766,128	1,102,542	1,757,742
Philadelphia, Pa	10	....	....	1,151	7	....
Portland and Falmouth, Me	11	68	16	47	60	79
Savannah, Ga	22	....	....	....	....	....
Gulf ports:						
Mobile, Ala	....	....	....	30	8	96
New Orleans, La	....	5	143	....	116	63
Mexican border ports:						
Arizona	18	85	416	115	....	14
Brazos de Santiago, Tex	....	....	....	19	4	....
Corpus Christi, Tex	414	13	....	30	208	....
Paso del Norte, Tex	760	67	13	....	80	206
Saluria, Tex	....	370	1,428	1,063	868	777
Pacific ports:						
Alaska	2,377	12,422	293	4,375	1,003	1,184
Oregon, Oreg	....	17,500	....	....	....	....
Puget Sound, Wash	80,495	55,727	150,906	58,278	29,212	36,145
San Diego, Cal	106	19	20	34	73	4
San Francisco, Cal	102,666	7,030	36,958	36,331	25,851	27,939
Willamette, Oreg	....	....	....	....	28	1,500
Northern border and Lake ports:						
Champlain, N. Y	234	1,464	449	1,542	1,183	2,142
Detroit, Mich	....	742	24	....	1,393	4,446
Genesee, N. Y	....	....	....	....	26	....
Huron, Mich	456	121	225	55	....	....
Memphremagog, Vt	....	....	6	7	24	....
Montana and Idaho	2	6	....	....	....	6
North and South Dakota	523	162	95	36	378	247
Superior, Mich	....	....	....	....	....	23
Vermont, Vt	301	115	20	40	....	22
Total	535,276	426,738	694,435	869,352	1,163,489	1,832,655
RECAPITULATION.						
Atlantic Ports	346,924	330,890	503,439	767,397	1,103,034	1,757,832
Gulf ports	....	5	143	30	124	159
Mexican border ports	1,192	535	1,857	1,227	1,160	997
Pacific ports	185,644	92,698	188,177	99,018	56,167	66,772
Northern border and Lake ports	1,516	2,610	819	1,680	3,004	6,895

EXPORTS, BY CUSTOMS DISTRICTS, OF DOMESTIC PICKLED, FRESH, ETC., SALMON, 1900 TO 1915—Continued.

Customs districts from which exported.	1906	1907	1908	1909	1910	1911	1912
Atlantic ports:							
Baltimore, Md.	$11			$31		$36	$77
Bangor, Me.			$7	58			2
Belfast, Me.	15	$8		11	$12		
New York, N. Y	1,781,330	1,786,105	1,590,757	1,230,436	1,479,625	1,514,563	1,586,221
Philadelphia, Pa.	105						
Portland and Falmouth, Me.	15	11,298	14	6	19		
Perth Amboy, N. J.							19
Gulf ports:							
Mobile, Ala.	14		128			201	
New Orleans, La.		$276	7,098	$49	$74	1,341	
Mexican border ports:							
Arizona	700	134	13	25		14	6
Brazos de Santiago, Tex.					5		
Corpus Christi, Tex.						4	140
Paso del Norte, Tex.	8	290	154				
Saluria, Tex.	80				197		56
Pacific ports:							
Alaska	44,436	451	803	1,091	212	4,517	2,532
Portland, Oreg.						1,320	
Puget Sound, Wash.	63,626	44,492	14,370	11,677	22,666	10,349	11,191
San Diego, Cal.	44		28	4	12	3	
San Francisco, Cal.	31,500	28,984	29,112	37,305	27,628	29,968	19,467
Willamette, Oreg.				743	3		
Hawaii				14			
Northern border and Lake ports:							
Buffalo Creek, N. Y				3,069			1,030
Cape Vincent, N. Y		92					
Champlain, N. Y	992	4,333	1,359	2,079	598	9,616	3,928
Detroit, Mich.	3,954	1,972	1,667			12	
Duluth, Minn.					68		108
Huron, Mich.	428		384	891		247	
Memphremagog, Vt.					20		
Minnesota, Minn.	40	52	708	59		301	21
Montana and Idaho	69	92	45	154	82	65	
Niagara, N. Y						426	799
North and South Dakota	36	3	30			10	
Superior, Mich.							4,427
Vermont, Vt.	61	161	1,387	858	1,419	136	127
Total	1,927,464	1,878,743	1,648,044	1,288,560	1,532,640	1,573,139	1,630,151
RECAPITULATION.							
Atlantic ports	1,781,476	1,797,411	1,590,778	1,230,542	1,479,656	1,514,599	1,586,319
Gulf ports	14	276	7,226	49	74	1,542	
Mexican border ports	788	424	167	25	202	18	202
Pacific ports	139,606	73,927	44,313	50,834	50,521	46,167	33,190
Northern border and Lake ports	5,580	6,705	5,580	7,110	2,187	10,813	10,440

Customs districts from which exported.	1913	1914	1915	Customs districts from which exported.	1913	1914	1915
New York	$2,060,068	$2,067,386	$1,377,840	All other districts	$8,119	$21,418	$9,592
Alaska	20,995	16,952	6,630	Total	2,122,566	2,195,309	1,424,859
Puget Sound	7,354	59,713	2,020				
San Francisco	26,030	29,840	28,777				

IMPORTS OF FRESH SALMON.

For some years it has been the custom of the canneries on Puget Sound, when fish were scarce on the American side and abundant on the Canadian side, to import fresh salmon to fill out the domestic supply, and the Canadian canneries would do the same when the conditions were reversed. In 1904 the Canadian Government prohibited the export of fresh sockeye salmon to Puget Sound for packing purposes, and in 1910 an effort was made to have Congress retaliate by enacting a similar law for this side of the line, but the bill failed of passage.

The table below shows the yearly imports of fresh salmon from British Columbia:

IMPORTS OF FRESH SALMON FROM BRITISH COLUMBIA, CANADA, FOR A SERIES OF YEARS.[a]

Years.	Pounds.	Value.	Years.	Pounds.	Value.	Years.	Pounds.	Value.
1890	4,600	$241	1897	98,454	$3,081	1904	40,010	$1,025
1891	4,960	170	1898	11,580	278	1905	1,015	25
1892	6,266	201	1899	68,002	4,101	1906	3,457,738	64,408
1893	64,811	3,690	1900	19,404	855	1907	112,224	4,131
1894	3,872	219	1901	27,073	2,080	1908	8,880	798
1895	14,000	1,462	1902	22,353	739	1909	41,073	2,346
1896	11,780	419	1903	6,860	343	1910	198,251	10,116

[a] After 1909 all imports of fresh salmon are listed under "Fish, fresh."

IMPORTS OF CURED SALMON.

Below are shown the imports into this country of foreign-cured salmon, the product of the Pacific salmon fisheries, from 1886 to 1909, inclusive.

IMPORTS OF FOREIGN PICKLED PACIFIC SALMON, 1886 TO 1909.[a]

Years.	British Columbia.		Japan.		Hongkong.		Russia, Asiatic.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1886	5,600	$224	....	....	....	....	....	....	5,600	$224
1887	200	4	....	....	....	....	....	....	200	4
1888	86,000	4,031	....	....	....	....	....	....	86,000	4,031
1889	18,200	360	....	....	....	....	....	....	18,200	360
1890	600	36	....	....	....	....	....	....	500	36
1891	200	5	....	....	....	....	....	....	200	5
1892	....	....	....	....	....	....	....	....	....	....
1893	5,478	291	....	....	....	....	....	....	5,478	291
1894	149,410	17,592	....	....	1,200	$29	11,875	$298	162,485	17,919
1895	6,550	250	....	....	600	13	....	....	7,150	263
1896	6,530	474	....	....	....	....	....	....	6,530	474
1897	6,800	156	....	....	....	....	....	....	6,800	156
1898	4,145	185	....	....	30	2	9,870	266	14,045	453
1899	15,875	1,554	....	....	....	....	....	....	[b]16,032	[b]1,560
1900	162,558	11,061	600	$41	....	....	....	....	163,158	11,102
1901	165,243	11,225	....	....	....	....	....	....	165,243	11,225
1902	175,411	12,794	606	29	....	....	....	....	176,017	12,823
1903	161,540	11,756	369	18	....	....	....	....	161,909	11,774
1904	282,210	23,319	1,400	52	....	....	....	....	283,610	23,371
1905	282,027	25,584	3,015	133	....	....	....	....	285,042	25,717
1906	35,475	1,730	5,510	175	....	....	....	....	40,985	1,905
1907	6,393	322	680	31	....	....	....	....	7,073	353
1908	13,230	631	4,185	174	....	....	....	....	17,415	805
1909	30,710	1,469	3,537	148	....	....	....	....	34,247	1,617
1910	111,045	5,505	....	....	....	....	....	....	....	....

[a] After 1909 all imports of salmon, pickled or salted, are included under "All other cured or preserved."
[b] Includes 157 pounds, valued at $6, from China.

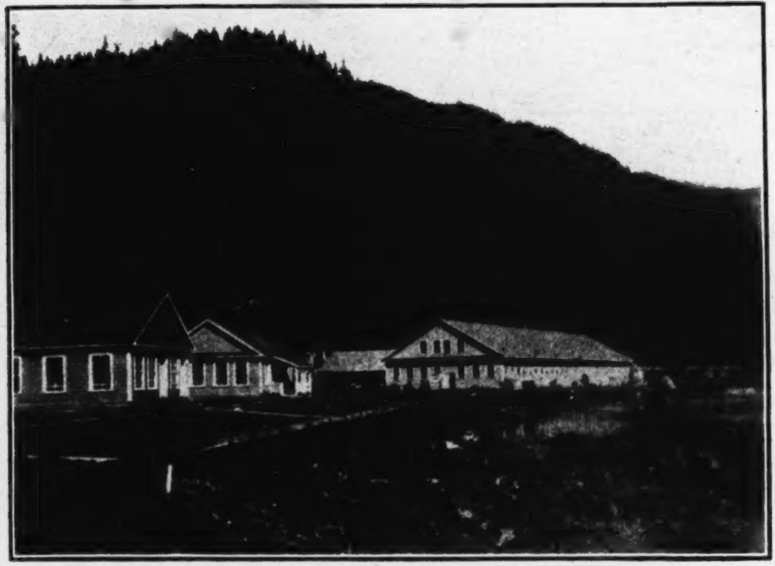


FIG. 1.—UNITED STATES SALMON HATCHERY, YES BAY, ALASKA.

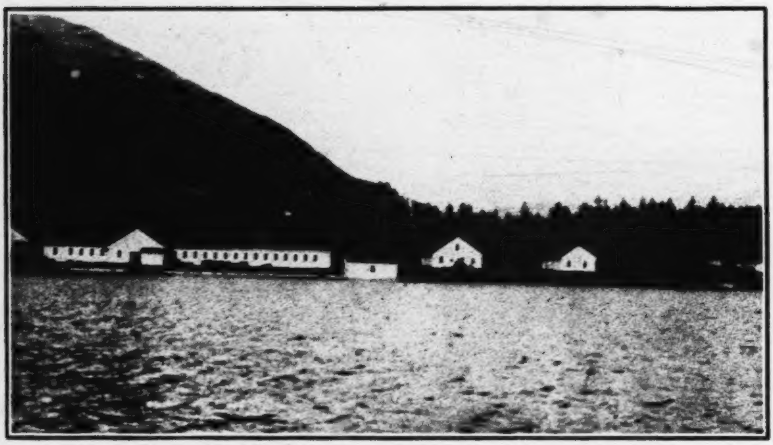
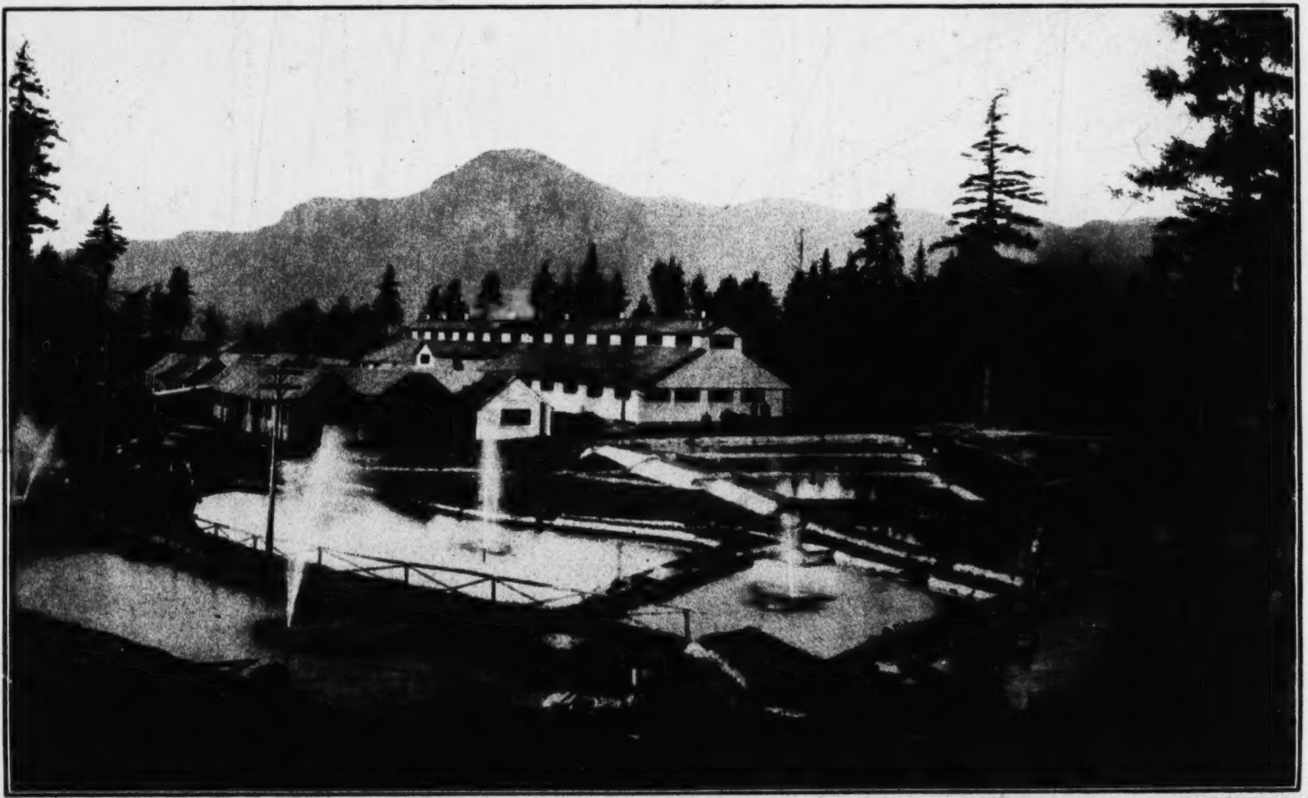


FIG. 2.—UNITED STATES SALMON HATCHERY, AFOGNAK, ALASKA.



BONNEVILLE SALMON HATCHERY OF THE OREGON FISH AND GAME COMMISSION, SHOWING REARING PONDS.

XIII. SALMON CULTURE.

The artificial culture of salmon on the Pacific coast has developed into a large and constantly expanding industry. The United States Bureau of Fisheries operates a number of large and well-equipped hatcheries, while the State governments of California, Oregon, and Washington, the Dominion of Canada, and the Province of British Columbia, and certain private companies have built and maintain a large number of hatcheries, some of these being among the largest in the world.

OBTAINING THE SPAWNING FISH.

The eggs used for artificial propagation are obtained from salmon taken on their way upstream to the natural spawning grounds. In order to arrest the ascent of the fish a rack is usually built across the stream. Where this is not feasible a trap is sometimes constructed for the purpose of catching the fish. Sometimes the racks have slat traps attached in which some fish are caught.

A number of methods have been employed for taking the fish as they are grouped below the rack and seeking for an opening, but the most practicable has been found to be by means of drag or haul seines swept across the area just below the rack. When the pocket or bunt is brought close to shore the workmen pick out the ripe fish and turn the others back to remain until they reach this stage. The ripe fish are placed in pens or live boxes made for this purpose, the males and females being kept separate. These live boxes are usually on the under side of a floating platform, and are accessible through hinged covers set in the plank flooring. Projecting beyond this platform is usually another, upon which the actual work of stripping the fish and caring for the pans is performed.

At a few places where the fish are caught before they have reached the ripe stage, notably Karluk, the fish are placed in a pound or corral and held until they become ripe. This method is resorted to only in case of necessity.

The surest sign of ripeness in a female is the separation of the eggs in the ovaries, but the experienced spawn taker can, from the general appearance of the fish, usually tell whether she is ripe or not, according to Bower.[a]

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[a] Fish culture in Alaska. By Ward T. Bower. Alaska fisheries and fur industries, 1911. United States Bureau of Fisheries, document no. 766, p. 70.

> An interesting experiment was conducted at the Afognak station last season [1910] to determine the degree of ripeness producing the best quality of eggs. The loss on the lot taken from females which were dead ripe—eggs flowing very freely—was less than 1 per cent, while with another lot, where the females were ordinarily ripe upon testing in the usual manner, the loss was about 5 per cent. This shows the need of caution in having fish fully ripe before stripping if the highest degree of efficiency is to be expected.

TAKING THE EGGS.

As the eggs of the females confined in pens are likely to be injured within the fish, stripping is usually done every day.

When ready for spawn taking one man lifts a female from the live box by means of a small dip net, while another man lifts out a male in the same manner. They are held suspended in the net until their violent struggles are over, when it is easy to handle them.

For many years, and even yet at many hatcheries, the method of taking salmon spawn has been by pressing the eggs out by steady downward pressure on the belly of the fish. The milt from the male is obtained in the same way.

Where the force is large and the fish rather small the quickest way is for one to hold the fish in one hand and press out the eggs or milt with the other. When the fish are large, or the working force is small, a strait-jacket is used. This is a sort of trough made about the average length of the salmon and hollowed out to fit its general shape. A permanent cleat is set across the lower end, while at the upper end is a strip with a buckle. The fish is slid into the trough, the tail going below the cleat, where it is securely held, and the head buckled in at the upper end with the strap. In this condition the fish is unable to do any harm by its struggles and the eggs can be pressed out at leisure.

A more modern method in use at many hatcheries, which has been well described by Mr. Bower,[a] is as follows:

> The long-followed process of taking Pacific salmon eggs by hand expression has been superseded in the last few years by the method of incision, a method discovered and developed by the late Cloudsley Rutter in connection with his study of the life history of the salmon of the Sacramento River. This consists simply of making a cut in the abdominal walls from the throat or near the pectoral fins to the vent, the fish just previously having been killed by a blow on the back of the head. When making the cut the knife is either shielded by a guard or is so held between the thumb and forefinger as to allow not more than half an inch of the blade to project, thus precluding the possibility of injuring any of the eggs. Immediately following the incision the eggs flow in a mass into the spawning pan beneath. The operator's fingers are inserted into the abdominal cavity gently to assist in removing any eggs that may be enfolded in the organs or that may merely adhere to the walls of the cavity. Fertilization is accomplished in the usual manner.

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[a] Fish culture in Alaska. By Ward T. Bower. Alaska fisheries and fur industries, 1911. United States Bureau of Fisheries, document no. 766, p. 60, 61.

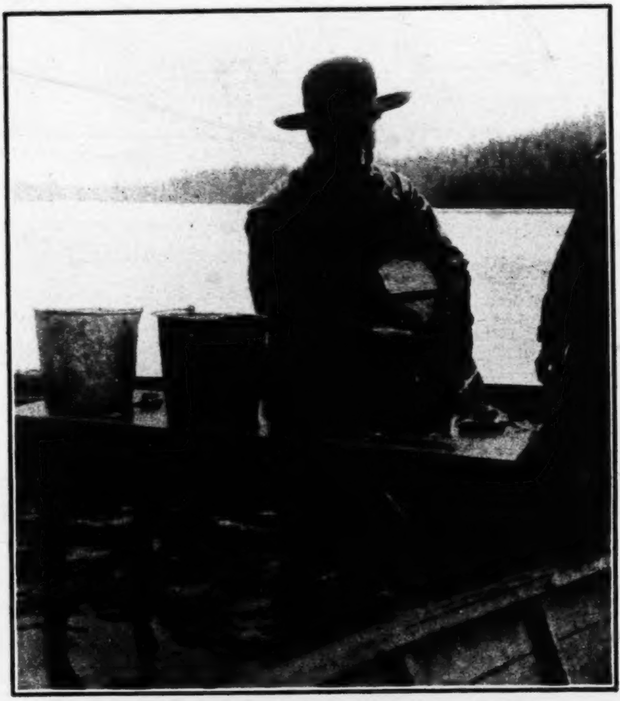

FIG. 1.—STRIPPING SALMON WITH AID OF STRAIT JACKET.

FIG. 2.—CHEHALIS HATCHERY, WASHINGTON FISH AND GAME COMMISSION, SHOWING RACKS TO PREVENT SALMON FROM GOING UPSTREAM AND PEN FOR HOLDING SPAWNING FISH.

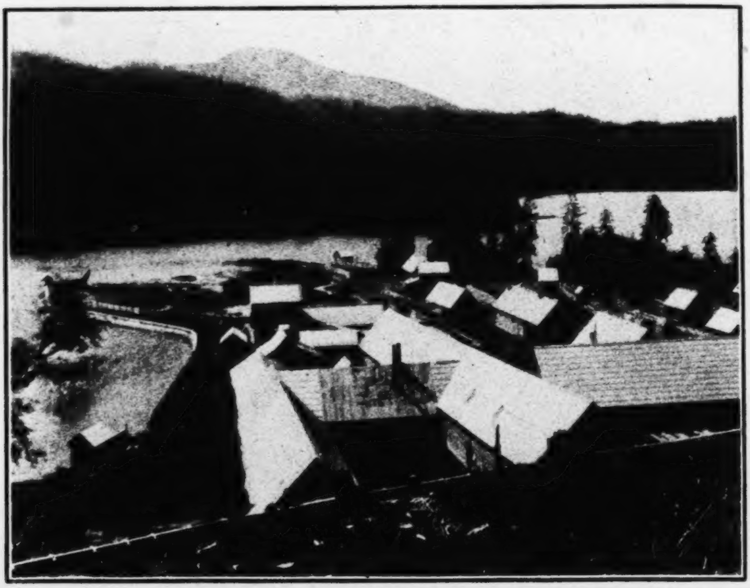

FIG. 1.—FORTMANN HATCHERY, NAHA STREAM, ALASKA, THE LARGEST HATCHERY IN THE WORLD.

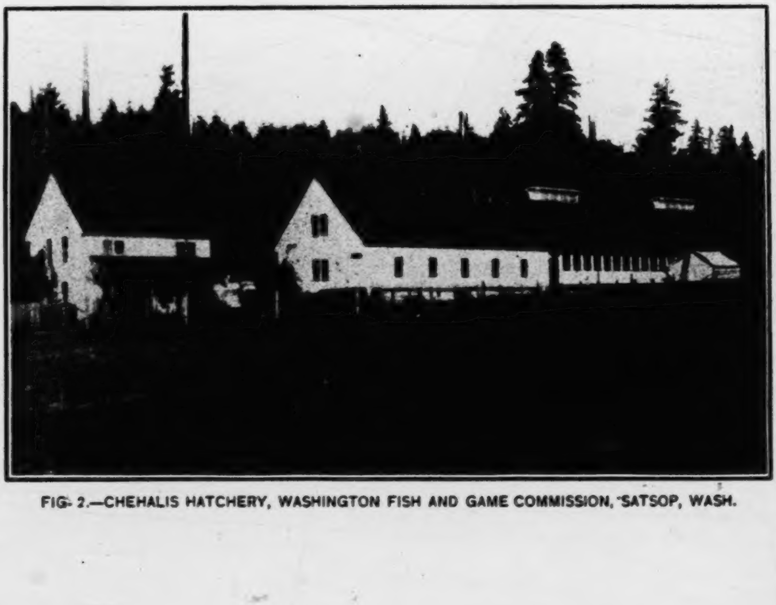

FIG. 2.—CHEHALIS HATCHERY, WASHINGTON FISH AND GAME COMMISSION, SATSOP, WASH.

Care must be exercised not to tear loose from the ovaries any eggs that do not come freely when the organs are moved from side to side by the fingers. Eggs thus torn loose are immature, and if taken it becomes necessary to eliminate them subsequently in the hatchery. It is preferable also to have the fish either in a vertical position or with the head considerably higher than the tail, that gravity may assist the flow of eggs.

It was at first thought necessary—and the practice still obtains at some stations—to bleed the fish either by cutting off the head or tail before making the incision. Experimentation, however, has conclusively demonstrated that no advantage results from this procedure, as the few drops of blood that may occasionally fall into a pan of eggs result in no harm. The extra labor involved in bleeding may therefore be dispensed with entirely.

When taken by the method of incision the eggs are of greatly improved quality; there is no straining or rupture of good eggs as is inevitably the result when heavy hand pressure is exerted; no unripe eggs are torn from the ovaries; and at the same time there is no waste of good eggs left enfolded in the organs, as is certain to be the case in stripping by hand. The improvement in quality is from 5 to 10 per cent and the saving in labor, too, is of noteworthy consideration.

The taking of Pacific salmon eggs by incision marks so distinct an advance in fish culture that it is no longer permissible to continue the obsolete method of stripping by hand.

FERTILIZING THE EGGS.[a]

In impregnating the eggs the main object is to bring the milt and the eggs together as quickly as possible after they have left the fish. By some persons a little water is considered desirable to give greater activity to the milt, but if left more than a minute in the water there is a decided loss of fertilizing power. The eggs do not suffer so quickly from immersion in water. The absorbing property which they possess when they first leave the parent fish, and which attracts to the micropyle the spermatozoa, lasts several minutes, but it is not prudent to leave the eggs in the water a moment longer than is necessary before adding the milt.

The additioh of the water is not essential to a good impregnation; in some instances better results are secured without the use of water and, after all, if the main object is secured, of bringing the milt and the eggs together with the slightest possible delay after they leave the fish, it makes very little difference whether water is used or not. The milt retains its fertilizing power several days when kept from air and water, and impregnation can be effected between fishes widely separated by merely forwarding the milt properly sealed. At Baird impregnation by the dry method, which has always been followed there, has resulted in the fertilization of about 90 per cent of the eggs so treated.

The Russian or dry method of impregnating eggs consists simply in taking both the eggs and the milt in a moist pan. It may be urged as an objection to this method that the eggs will be injured by striking against the pan, but it is a fact that although the same eggs would be destroyed by the concussion a week later, or even 24 hours later, they do not suffer in the least from it at the moment of extrusion from the fish.

It was at one time considered an important question whether the eggs or milt should be taken first, but with the dry method it makes no difference, as, either way, both eggs and milt remain operative long enough for all practical purposes of impregnation.

Various methods of treating the eggs in the pan after impregnation has taken place have been tried. Some operators leave the eggs in the pans as first taken with the milt for two or three minutes and then add water, after which they are left to stand in the pan until they separate, when they are washed clean, taken to the hatching house, and placed in the troughs. Others pour the contents of the several pans—eggs, milt, and all—into a large can after the eggs become impregnated, and when the eggs separate the contents of the can are poured into the hatching troughs, trusting to the current in the troughs to wash the milt from the eggs. At Baird, water is poured on the eggs a few moments after they become impregnated, after which they are left perfectly quiet until they separate, which, in water of the temperature of the McCloud River in September, 52° to 53°, takes about an hour. The pans, in the meanwhile, are put in a trough filled with river water to keep them from becoming too warm. After the eggs separate they are carefully washed and are carried in buckets to the hatching house, where they are measured and placed in the hatching trays.

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[a] A manual of fish culture, based on the methods of the United States Commission of Fish and Fisheries, revised edition, p. 10-12.

Mr. Bower[a] has the following to say as to the loss by concussion and the proper method of preventing same:

Coincident with the absorptive period in salmon eggs is an adhesive stage varying with the temperature from one to two hours, when the eggs are exceedingly sensitive. This is the so-called period of water hardening. Under no circumstances should the eggs be handled during this stage, nor should they be subjected to the slightest concussion. Repeated tests have demonstrated conclusively that even allowing the buckets containing the eggs to stand on the same platform where spawning operations are being carried on results in considerable loss.

To guard against this, the buckets should either stand on the bottom of the stream or else on a platform in every way independent of and having absolutely no connection with the main platform. To some this may seem like a small and irrelevant consideration, but strict observance is certain to reduce the loss by at least 2 or 3 per cent. During the process of water hardening the buckets should be partly submerged to properly regulate the temperature.

Due caution must be observed not to move the eggs until water hardening is complete. After a little experience the operator can readily tell, upon carefully inserting the hand and finding the eggs free and hard and no longer soft and velvety, even toward the bottom of the bucket, that they may be moved to the hatchery without fear of loss.

HATCHING APPARATUS AND METHODS.[b]

The hatching apparatus generally employed on this coast is pretty much of the same pattern and is described as follows:[c]

The hatching apparatus generally employed on the Pacific coast in salmon propagation consists of a combination of troughs and baskets. The troughs in common use are the so-called "Williamson troughs," which are 16 feet long, 12, or 16 inches wide, and 6½ inches deep. The troughs are arranged in pairs, and usually two or three pairs are placed end to end on different levels. The fall of water in each trough is 1½ inches. The troughs are divided by double partitions of wood or metal into compartments just enough longer than the baskets to enable the latter to be raised and lowered and to be tilted slightly. The essential feature of these troughs is that at the lower end of each compartment a partition, extending entirely across the trough, reaches from the bottom almost to the top, and another similar partition at the upper end of the compartment reaches from the top almost to the bottom of the trough, each set of partitions being about an inch apart. The water is consequently forced to flow under the upper partition and over the lower partition, and to do this it must necessarily second through the tray of eggs. The troughs are provided with canvas covers stretched upon light frames and made sunlight proof by saturation with asphaltum varnish, and their interiors are thickly coated with asphaltum.

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[a] Fish culture in Alaska, by Ward T. Bower. Alaska Fisheries and Fur Industries, 1911. United States Bureau of Fisheries, document no. 766, p. 81, 82.

[b] At some of the Alaska hatcheries quite large baskets, some holding as many as 103,000 red-salmon eggs are used.

[c] Manual of fish culture, based on the methods of the United States Commission of Fish and Fisheries, revised edition, p. 12, 13.

The egg receptacles are wire trays or baskets about 12 inches wide, 24 inches long, and deep enough to project an inch or two above the water, which is 5 or 6 inches deep in the troughs in which they are placed. Into each of these baskets 2 gallons of salmon eggs, equivalent to about 30,000, are poured at a time. The eggs suffer no injury whatever from being packed together in this manner, the water being supplied in a way that forces it through the eggs, partially supporting and circulating through them. The meshes are too small to permit the eggs to pass through, although the fry are able to do so.

The advantages of this apparatus and method are:

(1) The top of the tray or basket is out of the water and always entirely dry; consequently, in handling it, the hands are kept dry.

(2) By tilting one end of the tray up and down a little or by lifting it entirely and settling it gently back again in its place the bad eggs will be forced to the top; thus a feather is not required in picking over the eggs and the injuries very often inflicted with it are avoided.

(3) The top of the tray being above water, the eggs can never run over the top nor escape in any way, which is a great advantage over the shallow form of tray.

(4) There is economy of space; 30,000 to 40,000 eggs can be placed in each basket, provided a sufficient quantity of water is available. Two troughs 16 feet long and 1 foot wide will by this method carry about 500,000 salmon eggs. The deep trays may be filled at least half full of eggs, and thus 10 times as many eggs can be hatched in the same space and with the same supply of water as by the old method. A good but gentle circulation is continually maintained through the eggs.

(5) The deep-tray system is admirably adapted to getting rid of mud that has collected on the eggs, for all sediment accumulating about them can be easily removed by gently moving the tray up and down a few times in the water; but if the deposit of mud on the troughs becomes so excessive as to be unmanageable, a false bottom of wire cloth or perforated zinc can be placed in the troughs at a suitable distance above their real bottom, leaving a space of about 1 or 1½ inches between the wire cloth and the trough bottom. By this means the mud that comes into the trough will sift down into the space below the wire cloth entirely out of the way of the fish, the movements of the fish themselves helping very much to produce this result. Should the accumulation of mud in the space below the false bottom of the trough become too great, it can easily be sluiced out in various ways.

When quinnat salmon eggs are simply to be matured for shipment, hatching trays with one-fourth or one-fifth inch square mesh will answer the purpose, but when the eggs are to be hatched in them, every alternate strand of wire running lengthwise, or, better still, every second and third thread, should be left out in order to form an oblong mesh through which the newly-hatched fry, after separating themselves from the unhatched eggs, can escape from the hatching trays into the trough below.

At Baird eggs kept in water averaging about 54° F. hatch in 35 days. The allowance of 5 days' difference in the time of hatching for each degree of change in the water temperature is approximately correct.

For the first few days the eggs of the quinnat salmon are very hardy, and at this time they should be thoroughly picked over and the dead ones removed as far as possible before the delicate stage during the formation of the spinal column comes on, so that during that critical period they may be left in perfect quiet. As soon as the spinal column and the head show plainly, the eggs are hardy enough to ship, but when there is time enough it is better to wait a day or two until the eye-spot is distinctly visible, after which time the eggs will stand handling and may be safely shipped if properly packed.

HANDLING EGGS IN HATCHERY.[a]

At some of the Bureau's stations where salmon eggs are handled it was the custom until a few years ago to "bury" the eggs or leave them undisturbed (aside from picking once the day after spawning) for two or three weeks after putting them in the baskets. The result was that they were in some instances literally buried under and in such a mass of mud and sediment that many eggs were killed. Discontinuance of the practice resulted in a very appreciable improvement.

When the water is so turbid as to cause a heavy deposit of sediment, it is better to go over the eggs occasionally, even through the critical stages of development, or until the line of the fish is well formed. Of course the eggs must be handled with utmost caution at all times, but owing to their extreme sensitiveness during the two or three days following the closing of the blastopore and until a perceptible curve shows in the tail, they should be left entirely untouched. It soon becomes easy to determine the stage of an egg's development by holding it up to the light between the thumb and forefinger. In the absence of cautious and skilled operatives and unless the water is roily for an extended period, it is undoubtedly better to let the eggs remain undisturbed until the curvature of the tail is visible to the unaided eye. The accumulation of a moderate coating of sediment which readily washes off is not injurious. In a few instances it has become necessary to handle the eggs during the tender stage to arrest the spread of fungus, but where the water supply is reasonably well adapted to fish-cultural purposes such a course is rarely if ever necessary.

REMOVAL OF DEAD EGGS BY THE USE OF SALT SOLUTION.

Among the most noteworthy advances in fish-cultural methods during the last few years has been the use of salt as an aid in the removal of dead eggs. The development of this process has extended over a period of several years, but it is more during the last year or so through the efforts of L. E. Baldridge, of the Yes Bay station, that it has reached a high degree of efficiency.

Compared with the time-honored process of picking by hand, there are marked advantages in using the salt solution, and chief among these is the great saving of labor. It is estimated that if the eggs happen to be of not more than mediocre quality it would take at least 20 pickers to remove as many dead eggs as could 2 men using the salt solution. Moreover, the operation is much more thoroughly performed in the latter process than is possible in picking by hand.

Another advantage of using the solution is that it is possible thoroughly to clean the eggs. This greatly reduces any loss through contamination and infection resulting from the decomposition and fungous growths which inevitably follow the long-continued presence of dead eggs that in the hand-picking method frequently escape attention. Even when utmost care is taken to pick out all dead eggs, fungoused masses will occasionally appear. This condition is rarely observed when the salt solution has been used, and it undoubtedly means that in the aggregate many eggs are saved. Still another point in favor of the solution, it is generally believed, is that it acts as a tonic or stimulant to the good eggs while at the same time as a deterrent to the growth of fungus. Again, in picking by hand there is apt to be loss by movement of the eggs during delicate stages of development; and the oft-repeated insertion of egg tweezers, which are bound to touch other eggs, undoubtedly at times results in injury.

Recent experience has demonstrated that the solution may be applied effectively to eggs freshly taken as well as those in more advanced stages of development.

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[a] Fish culture in Alaska. By Ward T. Bower. Alaskan fisheries and fur industries, 1911. United States Bureau of Fisheries, document no. 766, p. 81, 82.

The principle of the salt bath is simply that the specific gravity of the good eggs is greater than that of the bad eggs, hence upon being placed in the salt solution the good eggs sink and the bad remain afloat and are easily removed. It is vitally essential to the success of the undertaking that the solution be of the proper strength, and it is for this reason that the beginner is apt to become discouraged. If the solution is too weak all the eggs, both good and bad, will sink, while if it is too strong all will remain afloat. The margin of the proper density is so narrow that in the operation it is necessary every few minutes to strengthen the solution by adding more salt or brine, otherwise the small amount of fresh water which adheres to a basket of eggs as it is lifted from the hatching trough into the solution will affect unfavorably the results when treating succeeding baskets. Experience and careful observation, however, will soon make it possible for the operator accurately to judge when to add a bit of the stock solution. It is a convenience, of course, to have a salinometer at hand when preparing the solution. It is commonly the practice as an aid in preparing the solution to test it occasionally with a few eggs.

Highly successful results in using the solution with red salmon eggs have been attained at the Yes Bay station, and a detailed description is accordingly given of the methods pursued at that place.

The chief item of equipment consists of a water-tight wooden tank 4 feet long, 2½ feet wide, and 10 inches deep for holding the solution in which the eggs are immersed. Before each basket is immersed it is necessary that the surface of the solution be perfectly quiet, for any ripple or current will tend to disturb the buoyant effect of the solution upon the eggs. Therefore it was found of great convenience last winter to use a floating frame made of half-inch material 6 inches wide fastened together vertically and at right angles, thus forming open squares about 6 inches either way. After each basket of eggs is lifted from the salt bath this frame is placed in the solution to stop all motion of the water, being pushed down until it is almost submerged and held firmly against the side of the tank for a few seconds. Upon being carefully withdrawn the solution is quiet and the next basket of eggs may be immersed without further delay.

Another piece of equipment is a feather fan with which gently to push the floating dead eggs away from over the submerged basket into which the good eggs have settled. Unless the dead eggs are quickly moved they too will sink. A feather fan made by fastening eagle feathers to a thin strip 8 inches long by 1½ inches wide works much more satisfactorily for this purpose than a wing. An ordinary hand scaff net about 12 by 14 inches in size for removing dead eggs from the tank, a dipper, and a bucket complete the outfit. Wood and metal surfaces in all equipment should be well coated with asphaltum or some similar preparation.

At Yes Bay as soon as five or ten million eggs are far enough advanced to stand light concussion the baskets are lifted out of the troughs and the eggs are stirred thoroughly with the hand, which causes practically all of the unfertile or empty eggs to turn white. As soon as the line of the fish shows plainly when held up to the light and there is a distinct curvature to the tail, the eggs are sufficiently well advanced in development to stand stirring. After this process the baskets are returned to the troughs and allowed to remain three days, for when first turned the unfertile eggs are about as heavy as the good eggs and consequently would sink if the salt solution were applied at once.

On the fourth day after stirring, everything being in readiness, five or six baskets are removed from a trough and set on top to drain. After a few moments a basket is grasped at each end and is lowered into the tank containing the solution until the liquid comes through the eggs. A light shake is then given to level up the eggs in the basket. Next, slowly and very gently, the basket is lowered until the brine comes almost to its rim and is held perfectly still for a moment. All the eggs in the basket will rise, but soon the good eggs will begin to sink, and presently, if it is a basket of poor eggs, the surface will be completely covered with bad eggs. Now, without the slightest jar, the basket is lowered far enough below the surface to permit an egg to float over the rim. The bad eggs will immediately start toward the edges of the tank. After a few seconds the basket is gently lowered until it rests upon the bottom. The remaining dead eggs are then brushed away from over the basket by means of quick, short, and light strokes of the feather fan; long, sweeping strokes are to be carefully avoided. One end of the basket is then gently raised until it is above the surface of the brine and the basket is drawn toward the end of the tank and out from under the floating dead eggs. At the same time the fan is used with the other hand to aid in moving any of these floating eggs to one side. The fan is then dropped and the lower end of the basket is grasped and the whole is quickly raised out of the solution. The basket is set at an angle on the tank for a moment to drain and is then carried to the hatching trough. The attendant lifts out another basket to drain along with the four or five others originally removed and returns to the tank of brine with the basket that has been draining the longest.

While this is being done the other operator skims the dead eggs off the surface of the brine and places the frame described above in the tank for a moment to stop all motion of the solution. After five or six baskets have been treated, any eggs that have settled to the bottom of the tank are removed, as they absorb and weaken the brine. It is necessary, as earlier mentioned, to add a little fresh brine after handling each basket. The eggs should be as clean as possible, as the solution will not be effective when it contains much sediment. A 1-inch hole with plug in one corner of the tank is convenient for drawing off any deposit of this character. Should failure occur in treating a basket of eggs, as, for example, if by sudden jar they are all caused to sink, or if the brine is too weak or too strong, the basket must be put back in the hatching trough, as it will not respond to treatment again the same day.

At Yes Bay last winter a large portion of the 72,000,000 eggs were thoroughly cleaned up at one handling. Two men ran as many as 10,000,000 eggs through the salt bath in a single day. It is customary on the day after treating the eggs to have them gone over so that if any dead eggs remain they may be picked out by hand. This, however, requires very little time, as but few dead eggs are found. No alarm need be felt if the eggs seem to shrink as a result of the immersion, for they will soon resume their normal size upon being replaced in fresh water.

The use of the salt solution has been extended lately to the handling of lake trout eggs in Michigan and Minnesota, and there appears to be no reason why it is not equally well adapted to the eggs of other salmonoids. Certainly its many advantages commend further experimentation in this direction.

The eggs of the salmon hatch very gradually at first, only a small proportion coming out the first day, but the number increases daily until the climax is reached, when large numbers of young burst their shells in a single day. As at this time the vast number of discarded shells are apt to clog up the guard screens at the outlets of the troughs, great care and vigilance is necessary to prevent this by thoroughly cleansing them frequently.

The hatched fish easily slip through the oblong mesh in the bottom of the trays into the space below. They should be assisted in doing this by gently raising and lowering the tray at intervals, care being taken not to raise them out of the water.

After they are all hatched out and in the bottom of the troughs, about the only danger to guard against is that of suffocation. They frequently crowd together in heaps and dig down under one another until some of them die for want of running water, which is less than an inch away from them. The best remedy in such a case is to thin them out.

John Pease Babcock, Assistant to the Commissioner of Fisheries of the Province of British Columbia, in 1910 advanced a novel suggestion that freshly fertilized eggs buried under sand and gravel immediately after would produce strong healthy fry at less cost than under existing hatching methods, and that fry so produced are stronger and more capable of resisting the attacks of their active enemies.

The short, but interesting, account of his experiments is reproduced entire.

> In writing of the propagation of salmon and trout, some authorities state that considerable loss is occasioned in natural propagation by many of the eggs becoming embedded in sand and gravel; that all the eggs so embedded are lost.
>
> Observation and experiment in the propagation of Pacific salmon and trout for a considerable period lead me to advance the theory that in natural propagation only those eggs which become embedded beneath several inches of sand and gravel produce alevins which live to attain the fry stage; and that those eggs which are not covered by several inches of sand and gravel are either consumed by active aquatic enemies or destroyed by vegetable molds, commonly termed "fungus."
>
> My experiments have demonstrated that the burial of freshly fertilized eggs of the *nerka* and other Pacific salmon does not smother them; that eggs so treated not only live but hatch; and that if they are covered to a sufficient depth the alevins produced survive and possess the instinct and power to work their way gradually to the surface; that if buried beneath 5 or 6 inches of sand and gravel such eggs will hatch, and the young will work their way up through the sand and gravel to the surface, and that by the time they emerge, have absorbed their sacs and are then exempt from the attacks of vegetable molds.
>
> Eggs buried under 1 or 2 inches of sand and gravel produce alevins that work their way up to the surface before the sac is absorbed, and upon reaching the surface are subject to attack by vegetable molds, and a very large percentage are thus destroyed, as well as by the more developed forms of aquatic life.
>
> Eggs buried to a depth of 3 inches produce alevins that work their way to the surface so gradually that by the time they reach the surface their sacs are so nearly absorbed that many, but not all, resist the effects of fungus. Alevins from eggs buried beneath less than 4 inches of sand are liable to reach the surface while the sac is so thinly covered that few, if any, survive the effects of fungous growth.
>
> The spawning beds of Pacific coast streams from California to Alaska (to which my observations have been confined), where the salmon spawn in numbers are, during and after the spawning period, covered with more or less vegetable molds. These molds are particularly common in the beds of streams where great numbers of salmon have spawned and died. Every experienced fish culturist knows that most waters carry great numbers of spores of fungi, and how difficult it is to prevent eggs and alevins from being attacked and injured by their growth. I believe that in natural propagation fungous growths destroy more salmon eggs and alevins than all other causes combined. The vegetable molds of Pacific streams are not active beneath the surface of the beds of streams. Salmon eggs cast therein, if even thinly covered with sand, are not injured by them. These molds do not affect the fry that have nearly or entirely absorbed their sacs, but they are deadly if permitted to attach themselves to either the eggs or the alevins.

My experiments along this line lead me to express the opinion that by the burial of freshly fertilized salmon eggs under 6 or 7 inches of sand and gravel strong healthy fry can be produced at less cost than under existing hatching methods, and that fry so produced are stronger and more capable of resisting the attacks of their active enemies.

I trust that this short statement of my experiments in the burial of salmon eggs may be deemed of sufficient economic importance to stimulate fish culturists generally in experimenting along similar lines. Those who do will perhaps experience some difficulty at first in the covering of a large number of eggs. Experimenters will find that after preparing suitable beds of sand and small gravel the eggs can be evenly laid and held until covered, if the surface of the bed is first thickly indented with cells a little deeper than the eggs. This can be readily accomplished by stamping the bed with a board covered with projections or pegs of suitable size.

My experiments suggest that in the near future most of the buildings and hatching apparatus now used in the propagation of salmon and trout will be dispensed with; that after the eggs have been expressed and fertilized, instead of being placed in wire baskets in hatcheries, they will be buried beneath the sand and gravel of the beds of natural or prepared streams, and that with the exception of watchmen to protect them, little or no other labor will be required.[a]

FEEDING AND PLANTING THE FRY.

For some time the fry remain at the bottom of the trough, but when the yolk sac is nearly absorbed they rise from the bottom and begin swimming. As a rule the fry are planted about the time the yolk sac is absorbed, thus obviating the necessity for feeding them. Some experts advise planting young red salmon when the umbilical sac is about two-thirds absorbed, which is the time when the fish begin to swim up freely. With the temperatures prevailing at the Alaska hatcheries, this means that the fry must be held at least four or five weeks after hatching.

PACKING EGGS FOR SHIPMENT.

In packing salmon eggs for shipment it is the custom at the Bureau of Fisheries's hatcheries to use a packing box made of one-half inch pine, 2 feet square and 1 foot deep.[b]

At the bottom is placed a thick layer of moss, then a layer of mosquito netting, then a layer of eggs, then mosquito netting again, then successive layers of moss, netting, eggs, netting, and so on to the middle of the box. Here a firm wooden partition is fastened in and the packing renewed above in the same manner as below. The cover is then laid on the top, and when two boxes are ready they are placed in a wooden crate, made large enough to allow a space of 3 inches on all sides of the boxes. This space is filled with hay to protect the eggs against changes of temperature, and, the cover being put on the eggs, they are ready to ship. In the middle of the crate an open space about 4 inches in depth is left, between the two boxes of eggs, for ice. As soon as the crates arrive at the railway station this space, as well as the top of the crate, is filled in with ice. Recent experiments show that salmon eggs can be packed and safely transported to considerable distances when they are first taken.

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[a] Some experiments in the burial of salmon eggs—suggesting a new method of hatching salmon and trout. By John Pease Babcock. Trans. Am. Fish. Soc., 1910, p. 393-395. Washington, 1911.

[b] A manual of fish culture, based on the methods of the United States Commission of Fish and Fisheries. Revised edition, p. 14.

REARING SALMON FRY.

For many years it was the custom to plant the fry as soon as they had absorbed the yolk sac, a period of about 30 days. A few thousands were sometimes raised to the fingerling, yearling, or adult stage, more as a curiosity than anything else. No particular difficulty was experienced in raising these fish, but the expense entailed in feeding them for a prolonged period, and the impossibility of doing so unless large ponds were constructed at great expense for the purpose of holding them during the feeding period, prevented the general adoption of the rearing system.

For some years certain fish culturists had contended that the planting of fry just after they had absorbed the umbilical sac was an economic mistake, claiming that at this age they were weak and comparatively sluggish in their movements, and would fall easy prey to their numerous fish, bird, and other enemies. The late Robert D. Hume, who built and operated a hatchery on the lower Rogue River, also one on the upper Rogue River, which the United States Bureau of Fisheries operated for some years, was one of the first to take up the rearing of salmon fry on any scale.

In time these objections bore weight, and a few years ago the construction of ponds in which fry could be held and fed until they had reached a size which would insure them at least an even chance for their lives was undertaken all along the coast except in British Columbia, with the result that to-day there is pond capacity for about one-half of the total capacity of the various hatcheries.

Most of the nursery ponds have been constructed near the hatcheries and usually comprise oblong trenches dug in the earth and walled with cement and stone.

In Oregon the State authorities found that the best results in pond rearing were obtained by using creek or natural ponds, which were made by placing dams across the small streams in the vicinity of the hatcheries. When first taken from the hatching troughs the fry are placed in the artificial ponds until the danger from spring freshets in the small streams is over, when the fry are transferred to the natural ponds, where the continual flow of fresh water, and the logs, rocks, etc., which provide shade and shelter, afford more natural conditions, and in which the natural food of the fry supplements the artificial food provided by man.

The young fry show when they are ready to feed by darting to one side or the other when small particles of food are dropped in the water and float past them. For the first few weeks they should be fed regularly and as often as six times a day, and the earlier in the day the feeding begins and the later it continues at night the better. Two hours after feeding they will be found to be ravenously hungry, and as they grow much faster for frequent feeding great care should be taken to see that they are well fed. If not fed sufficiently they will bite at one another and cause more or less mortality among themselves.

A big advantage in connection with the use of natural ponds is the comparatively small expense involved in providing for them as compared with the large expense involved in the construction of cement ponds.

FOOD.

In feeding salmon fry almost every conceivable food has been utilized. By universal consent liver is conceded to be the best food for the fry, as it can be ground finer than other foods and the blood which it contains is highly nutritious. At many places, however, it is impossible to secure liver, while its cost when available is generally prohibitive.

The food used is generally that most available and which experience has shown that the fry like and upon which they thrive.

In Oregon [a] it has been found that the extremely young fry thrived on a mixture of ground dried salmon and mush (composed of middlings and other wheat products). Milk curds from near-by creameries also proved satisfactory. The older fish are fed on ground smelt, lamprey eels, spent salmon, both dried and salted, and offal from the canneries, some loose and some packed in 1-gallon cans.

SALMON HATCHERIES ON THE PACIFIC COAST.

Below is shown a list of the salmon and steelhead-trout hatcheries operated on the Pacific coast during the year 1915:

Hatcheries.	Collecting stations.
U. S. BUREAU OF FISHERIES.	
Alaska:	
Afognak	Eagle Lake. Uganik Lake.
Yes Bay	Ketchikan Creek.
California:	
Baird	
Battle Creek	
Hornbrook	
Mill Creek	
Oregon:	
Clackamas	Eagle Creek.
Applegate	Eagle and Tanner Creeks.
Illinois River	
Lower Rogue River	
Rogue River	
Willamette River	
U. S. BUREAU OF FISHERIES—continued.	
Washington:	
Baker Lake	
Birdsview	
Darrington	
Day Creek	
Duckabush	
Illabott	
Quilcene	
Sultan	
Big White Salmon	
Little White Salmon	
STATE OF CALIFORNIA.	
Sisson	
Brookdale	
Price Creek	
Ukiah	Snow Mountain.

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[a] Rearing and feeding salmon fry in Oregon. By R. E. Clanton. Trans. Pac. Fish. Soc., 1914, p. 91-94. Seattle, 1915.

Hatcheries.	Collecting stations.
STATE OF OREGON.	
Wallowa River	Upper Sandy River.
McKenzie River	Lower Sandy River.
Salmon River	
Bonneville	
Santiam River (eyeing station).	
Klaskanine	
Willamette River (eyeing station).	
Eagle Creek	
Snake River (Idaho)	
Tillamook	
Yaquina	
Siuslaw	
Umpqua	
South Coos	
Coquille	
Alsea	
Rogue River	
STATE OF WASHINGTON.	
Dungeness	
Elwha	
Green River	
Green River (eyeing station)	
Nooksak	
Nooksak River, north fork	
Nooksak River, south fork	
Pilchuck	
Samish	
Skagit River	
Skokomish	
Snohomish	
Startup	
Stillaguamish	
Chinook	
Kalama	
Lewis River	
Pateros-Methow	
Wenatchee	
Tilton River	
STATE OF WASHINGTON—con.	
Wind River	
Chehalis	
Humptulips	
Willapa	
Cold Creek (Clarke County)	
DOMINION OF CANADA.	
Granite Creek	
Pemberton	
Harrison Lake	
Stuart Lake	
Skeena River	
Babine Lake	
Rivers Inlet	
Fraser River	
Anderson Lake	
Kennedy Lake	
Cowichan Lake	
PROVINCE OF BRITISH COLUMBIA.	
Seton Lake	
BRITISH COLUMBIA PACKERS ASSOCIATION.	
Nimpkish Lake	
ALASKA (PRIVATE HATCHERIES).	
Alaska Packers Association: Fortmann. Karluk.	
Northwestern Fisheries Co.: Quadra. Hetta.	
North Pacific Trading & Packing Co.: Klawak.	

GENERAL STATISTICS.

Distribution of fry, etc.—In the following table is shown by years and species the distribution in Pacific coast waters of fry, fingerlings, yearlings, and adults from 1873, when the first hatchery began operation, to 1915, inclusive. The figures on fingerlings, yearlings, and adults are not as complete as could be wished, this being due to certain of the State fish commissions not separating them from the fry in the published results.

The table shows the enormous total of 6,291,011,445 fry and 26,290,421 fingerlings, yearlings, and adults as having been deposited in local waters since the inception of the work on this coast. Of these nearly one-half were sockeye, or red salmon, followed by chinook, or spring, coho, or silver, chum, steelhead trout, and humpback salmon in the order named.

This table does not show the large number of eggs, fry, etc., shipped from the coast hatcheries to other sections of the country and to various foreign countries. These appear in the tables shown under the various States, Provinces, and Territories.

DISTRIBUTION OF SALMON FRY, ETC., IN THE PACIFIC COASTAL STREAMS OF NORTH AMERICA, IN SPECIFIED YEARS.

Years.	Chinook, king, or spring.		Cobo, or silver.		Chum, fry.	Humpback, or pink, fry.
	Fry.	Fingerlings, yearlings, and adults.	Fry.	Fingerlings, yearlings, and adults.		
1873	530,000					
1874	850,000					
1875	2,200,000					
1876	2,000,000					
1877	2,560,000					
1878	2,582,620					
1879	5,376,500					
1880	4,080,200					
1881	4,974,780					
1882	3,991,750					
1884	660,000					
1886	150,000					
1887	200,000					
1888	2,590,000					
1889	3,106,000					
1890	5,250,475					
1891	9,299,000					
1892	4,299,900	25,000				
1893	10,825,950					
1894	8,427,900		280,000			
1895	6,458,000		910,000	560,000		
1896	25,681,032	807,150				
1897	31,146,085		298,137			
1898	73,084,078					
1899	56,773,261		180,000			
1900	33,974,064		13,935,104		10,201,700	
1901	26,563,136	1,008	20,047,935		16,478,280	
1902	73,852,120		41,436,123		9,937,390	
1903	75,558,289		34,469,291		10,012,390	
1904	161,580,968		23,804,026			521,707
1905	143,714,117		30,743,493			
1906	167,746,494	122,980	47,356,449	300	3,268,800	909,990
1907	124,578,390		44,426,380		6,120,000	4,224,255
1908	135,447,179	2,165,797	54,108,587		4,342,350	31,920,062
1909	88,196,707	16,949	50,848,674		7,806,000	10,000
1910	97,361,533	225	45,982,982		8,607,500	2,251,340
1911	80,570,265	11,700	53,899,780		13,435,780	460,150
1912	101,810,515	1,405,900	66,087,446	116,300	4,684,950	34,205,460
1913	112,006,896		79,312,820		35,792,440	1,888
1914	133,271,477	2,571,711	67,682,576		16,623,984	39,085,814
1915	149,998,221	9,878,746	92,996,831		63,088,372	7,887,494
Total	1,969,419,287	17,004,785	767,488,571	676,600	210,498,966	122,118,340

DISTRIBUTION OF SALMON FRY, ETC., IN THE PACIFIC COASTAL STREAMS OF NORTH AMERICA, IN SPECIFIED YEARS—Continued.

Years.	Sockeye, red, or blueback.		Steelhead trout.		Total.	
	Fry.	Fingerlings, yearlings, and adults.	Fry.	Fingerlings, yearlings, and adults.	Fry.	Fingerlings, yearlings, and adults.
1873	....	....	....	....	330,000	....
1874	....	....	....	....	850,000	....
1875	....	....	....	....	2,250,000	....
1876	....	....	....	....	2,000,000	....
1877	....	....	....	....	2,550,000	....
1878	....	....	....	....	2,562,020	....
1879	....	....	....	....	5,376,500	....
1880	....	....	....	....	4,050,200	....
1881	....	....	....	....	4,974,790	....
1882	....	....	....	....	3,991,750	....
1884	....	....	....	....	900,000	....
1885	1,800,000	....	....	....	1,800,000	....
1886	2,625,000	....	....	....	2,775,000	....
1887	4,414,000	....	....	....	4,614,000	....
1888	5,807,000	....	....	....	8,307,000	....
1889	4,419,000	....	....	....	12,567,000	....
1890	6,640,000	....	....	....	11,890,475	....
1891	3,603,800	....	....	....	12,872,800	....
1892	6,000,000	....	....	....	16,290,000	25,000
1893	6,274,000	....	....	....	17,096,960	....
1894	8,504,000	....	353,500	....	17,565,400	....
1895	11,681,000	....	....	....	19,049,000	500,000
1896	15,808,000	....	107,808	....	41,556,841	807,130
1897	18,374,440	....	282,000	....	50,080,672	....
1898	20,916,000	....	650,000	....	95,250,076	....
1899	15,761,000	....	8,625	....	72,731,976	....
1900	29,590,000	....	2,061,560	....	88,852,486	....
1901	19,901,253	....	1,709,836	....	94,690,922	1,666
1902	72,679,000	....	3,243,948	....	201,148,561	....
1903	89,398,789	....	4,509,641	37,033	212,980,509	37,033
1904	70,710,200	....	4,207,920	....	200,964,908	....
1905	119,963,200	....	3,805,675	....	296,226,484	....
1906	232,087,442	....	6,725,965	24,383	456,104,149	147,663
1907	278,018,450	....	5,633,493	....	412,996,968	....
1908	230,528,455	....	5,837,671	....	462,184,874	2,165,797
1909	239,251,146	....	8,193,778	....	394,097,305	16,949
1910	306,215,795	....	11,366,446	....	561,966,565	225
1911	257,463,497	....	14,995,717	....	419,796,138	11,700
1912	334,326,768	....	12,710,383	177,790	543,824,881	1,699,950
1913	242,146,060	....	16,654,906	....	465,918,028	....
1914	261,365,781	....	11,719,558	....	530,349,199	2,571,711
1915	198,910,010	8,369,830	22,942,900	....	535,401,818	18,245,575
Total	3,145,192,003	8,369,830	137,696,819	239,206	6,371,296,578	26,290,421

Output of Bureau of Fisheries hatcheries.—The table below shows by years and species the combined output of the various hatcheries of the United States Bureau of Fisheries on this coast. . The greater part of the egg output was to various State hatcheries on the Pacific coast, more particularly those belonging to the State of California. The total figures show that since the Bureau began operations on this coast it has distributed 966,240,303 eggs, 603,076,619 fry, and 31,176,283 fingerlings, yearlings, and adults.

OUTPUT OF PACIFIC COAST SALMON HATCHERIES OWNED BY THE UNITED STATES BUREAU OF FISHERIES, 1872 TO 1915.

Year ending June 30—	Chinook, king, or spring.			Coho, or silver.		
	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
1872	30,000					
1873	1,400,000					
1874	4,155,000	850,000				
1875	6,250,000	1,750,000				
1876	5,065,000	1,500,000				
1877	6,983,000	2,000,000				
1878	7,810,000	2,500,000				
1879	4,250,000	2,300,000				
1880	3,800,000	2,000,000				
1881	4,300,000	2,100,000				
1882		3,981,730				
1883		770,125				
1889 [a]	3,450,000	6,000,000				
1890	2,554,000	2,980,475				
1891	3,688,000	5,678,526				
1892	2,902,000	1,647,900				
1893	3,530,000	5,290,100				
1894	7,500,000	651,500			280,000	
1895	3,690,000	500,000			690,000	560,000
1896	3,798,500	3,547,850	557,150			
1897	18,232,500	9,828,095			298,137	
1898	30,605,000	30,950,098				
1899	32,618,000	9,306,366				
1900	7,411,000	14,287,264			146,824	
1901	11,615,006	7,987,107	1,008		302,041	
1902	19,446,410	20,340,308			424,530	
1903	16,160,177	23,845,956	250	680,800	81,812	
1904	75,217,354	35,006,988			3,964,645	
1905	96,055,765	21,620,292		167,000	9,321,513	
1906	115,648,146	30,797,543	123,118	229,180	6,445,574	306
1907	78,567,705	17,567,092		700,000	3,636,962	
1908	68,520,550	24,906,185	2,165,787	298,000	13,420,714	57,903
1909	38,850,265	20,177,268	16,949	272,000	9,470,925	
1910	33,306,700	15,662,084	226	275,000	10,888,025	
1911	37,314,514	16,650,684	211,700	2,301,900	6,210,266	
1912	36,837,560	31,040,898	1,405,560	52,000	12,955,824	
1913	56,206,873	32,419,423		202,000	13,982,983	
1914	31,032,645	46,895,607	5,582,796	95,840	24,619,456	27,298
1915	25,751.005	52,612,066	9,604,985	111,200	34,018,355	267,063
Total	908,680,703	521,027,133	19,670,498	5,402,920	141,148,586	913,153

Year ending June 30—	Chum, fry.	Humpback, or pink.		Sockeye, red, or blueback.		
		Eggs.	Fry.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
1900					10,683,000	
1901					3,834,453	
1902					3,371,000	
1903					3,731,789	
1904			176,597		3,855,000	
1905					7,819,281	10,000
1906		2,000	969,900	880,000	9,923,690	9,500
1907					58,835,055	
1908		502,000	6,764,762	75,000	69,883,305	
1909			10,000	100,000	93,408,496	
1910			1,731,740		146,081,595	
1911	911,650	100,000	460,150		100,490,900	
1912	2,495,000	3,271,740	2,586,325	2,000,000	91,422,273	
1913	19,479,000		1,880	2,000,000	78,724,900	
1914	8,672,735	13,260,000	[b]37,652,777	6,030,000	53,071,574	120,000
1915	35,504,707	14,500,000	[c]7,272,980	155,000	46,282,693	8,416,465
Total	67,063,092	31,635,740	57,607,201	11,230,000	781,418,993	8,555,965

[a] Operations suspended from 1884 to 1888, both inclusive.
[b] Includes 4,355 fingerlings, adults, and yearlings.
[c] Includes 110,480 fingerlings, adults, and yearlings.

OUTPUT OF PACIFIC COAST SALMON HATCHERIES OWNED BY THE UNITED STATES BUREAU OF FISHERIES, 1872 TO 1915—Continued.

Year ending June 30—	Steelhead trout.			Total.		
	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
1872				30,000		
1873				1,400,000		
1874				4,155,000	830,000	
1875				6,280,000	1,750,000	
1876				5,065,000	1,500,000	
1877				4,983,000	2,000,000	
1878				7,810,000	2,500,000	
1879				4,250,000	2,300,000	
1880				3,800,000	2,000,000	
1881				4,300,000	3,100,000	
1882					3,981,750	
1883					776,125	
1889 [a]				2,460,000	6,000,000	
1890				2,554,000	2,980,475	
1891				3,088,000	5,078,826	
1892				2,902,000	1,047,900	
1893				3,630,000	5,200,100	
1894	75,000	308,500		7,575,000	1,240,000	
1895		882,500	222,000	3,080,000	3,042,800	892,000
1896	175,000	107,808		2,973,800	3,653,658	557,150
1897	50,000	257,000		18,282,800	10,382,380	
1898	60,000	650,000		30,865,000	40,000,086	
1899	150,000	12,125		33,777,000	9,378,491	
1900	415,000	125,000		7,838,000	25,242,088	
1901	246,000	65,800	25,000	11,881,038	12,158,451	26,683
1902	481,000	130,250		19,927,410	22,206,096	
1903	480,000	702,700	385,848	17,339,977	28,362,257	296,698
1904	225,000	93,205	11,000	75,442,354	43,116,436	11,000
1905	464,400	537,206		98,027,165	39,386,381	10,000
1906	358,000	1,834,485	40,232	117,127,326	30,971,272	173,301
1907	250,000	1,190,305		79,807,705	81,280,694	
1908	457,725	1,089,886		60,881,275	116,156,362	2,223,729
1909	453,725	1,670,871		39,714,980	126,737,076	16,949
1910	300,000	3,511,228		28,881,780	177,094,680	225
1911	980,000	3,836,430		40,496,414	128,580,119	211,769
1912	905,000	4,280,415	294,000	43,066,280	144,780,730	1,899,980
1913	1,230,000	4,272,226		61,828,873	140,980,386	
1914	729,000	4,022,436		51,127,485	176,934,587	5,790,054
1915	877,000	5,202,973	1,048,317	41,394,305	171,983,782	19,237,309
Total	9,210,900	34,811,616	2,026,729	998,240,288	833,076,619	31,176,263

[a] Operations suspended from 1884 to 1888, both inclusive.

ACCLIMATIZING PACIFIC SALMON IN EASTERN WATERS.

For many years efforts have been made by the United States Bureau of Fisheries and various State fish commissions to introduce Pacific coast salmon in eastern waters. In the early history of fish culture chinook fry were planted in almost every imaginable stream along the Atlantic seaboard, in various streams in the Mississippi Valley, and also in tributaries of the Great Lakes. In most cases, owing to the unsuitability of the water, the experiment was doomed to failure from the start. In the case of a few streams where results might have been obtained, the plantings were at long intervals and the fish were too small to protect themselves, while no effort was made by the State authorities to protect them.

The most successful results with plants of chinook salmon have been obtained in Lake Sunapee, N. H., where it is now a not uncommon thing for anglers to catch chinooks with rod and reel.

In 1912 about 10,000 chinook fingerlings from Columbia River eggs furnished by the United States Bureau of Fisheries were planted by the Massachusetts Fish Commission in Lake Quinsigamond, and during July, 1914, about 20 months after they were hatched, over 600 salmon, according to a member of the commission, were caught, ranging from 1½ to 5 pounds each.

The most successful effort in this line was initiated by the United States Bureau of Fisheries in the fall of 1913, when it transferred from its hatcheries on the Pacific coast to those in Maine 13,240,000 humpback-salmon eggs. These were followed by a second shipment of 7,022,000 eggs in the fall of 1914, and of a third shipment of about 7,000,000 eggs in the fall of 1915. These eggs were hatched out and the fry planted in various selected New England streams where the conditions seemed favorable.

Early in August, 1915, a female humpback salmon 22½ inches long and weighing 4 pounds, 3 ounces, was taken at the Bangor waterworks in the Penobscot River. Shortly after a male fish of about the same size was taken in this river at Orland dam. A little later agents of the Bureau captured 20 alive near Bangor, and about 3,000 eggs were obtained and fertilized.

In Dennys River, in Maine, during the period between August 15 and September 24, local fishermen caught a number.

CALIFORNIA.

HISTORY.

The first fish-cultural station on the Pacific coast was located on McCloud River, a stream of the Sierra Nevada Mountains emptying into Pit River, a tributary to the Sacramento, 323 miles nearly due north of San Francisco. The site on the west bank of the river, about 3 miles above the mouth, was chosen after investigation of a number of places on the Sacramento, by Livingston Stone, one of America's pioneer fish culturists, and the station was named Baird, in honor of the then Commissioner of Fisheries, Prof. Spencer F. Baird. Although the season had nearly passed when the station was sufficiently advanced to handle eggs, 50,000 eggs were secured, and while 20,000 were lost, owing to the excessive heat, the remaining 30,000 were shipped east, all of which were eventually lost but 7,000 fry, which were planted in the Susquehanna River, in Pennsylvania.

The main object of the hatchery the first few years was to secure eggs to ship to the East for the purpose of introducing Pacific salmon in the waters in that section. The Commission early made an agreement with the State of California, however, under which the latter at first paid part of the expense, and the Commission hatched and planted a portion of the take in the McCloud River. Later, part of the eggs were turned over to the State, which hatched and planted the salmon in local waters.

In 1881 the station buildings were washed away in a freshet, but were immediately rebuilt. From 1884 to 1887, both inclusive, all operations were suspended.

In 1889 a hatchery was established at Fort Gaston, on the Army reservation in the Hoopa Indian Reservation in Humboldt County, but it was not put into operation until 1890. As the reservation was abolished on July 1, 1892, the Commission took complete charge of the plant, and in 1893 established a tributary station on Redwood Creek. The same year Korbel station was established about one-half mile above Korbel, on Mad River, in Humboldt County. Owing to the lack of money this station was closed in the fiscal year 1896, but was reopened during the fiscal year 1897.

That same year the Commission erected, on ground owned by the State, a hatchery at Battle Creek in Tehama County and also took charge of and operated the hatchery erected at this place by the State fish commission the previous year. Under the terms of an agreement the Commission was to deliver to the State as many eyed spawn as the latter could hatch at Sisson, its own station.

Owing to their inaccessibility the Fort Gaston hatchery and its substations were abandoned in 1898. The same year an experimental station was established at Olema, Bear Valley, in Marin County, whence eggs were transferred from Baird station, hatched out here, and planted in Olema Creek in order to see if they could not be domesticated here, where they had not been found previously.

During the fiscal year 1902 a substation was established on Mill Creek, a stream which has its source in the foothills of the Sierra Mountains, in the northeastern part of Tehama County, and empties into the Sacramento River from the east about a mile above the town of Tehama. The eggs are retained here until eyed and then shipped to other hatcheries.

As stated above, the State aided the work of the United States Fish Commission in a financial way and also by hatching and distributing the eggs turned over to its care. In 1885 the State Legislature passed a bill authorizing the establishment of a hatchery of its own, and the same year such a station was built upon Hat Creek about 2½ miles above its junction with Pitt River, a tributary of the Sacramento River. As the work of the first few seasons developed that the location was unsuitable, the hatchery was removed in 1888 to Sisson, in Siskiyou County. The work of this hatchery was to handle the eggs turned over to it by the United States Fish Commission.

In 1895 another hatchery was built by the State near the mouth of Battle Creek, a tributary of the Sacramento River. In 1896 and 1897 this hatchery was operated jointly by the State and the United States Fish Commission while awaiting the appropriation of money by the Commission to purchase it from the State.

In the fall of 1897 a hatchery was established by the State at Grizzly Bluff, on Price Creek, a tributary of Eel River, in Humboldt County, and in 1902 this hatchery made the first plant in the State of steelhead trout fry.

Santa Cruz County has had a hatchery at Brookdale for a number of years. In 1911 it was leased to the State and operated by the latter during the seasons of 1911 and 1912. In 1913 the State gave up the lease and entered into a contract to purchase the eggs produced from this hatchery. The price agreed upon was that the State Commission was to pay $1.50 per thousand for the eyed steelhead eggs, up to the number of 2,000,000, and $1 per thousand for all eggs up to 3,000,000, provided that the eggs were collected and eyed by a skilled fish culturist and would pass inspection before they were accepted.

A hatchery was established by the United States Bureau of Fisheries at Hornbrook, on Klamath River, in 1913. At first this hatchery was devoted to rainbow trout work, but later the collection and distribution of silver and chinook salmon was taken up.

During the fall of 1911 the State established an experimental station at Sacramento in order to carry on a series of experiments to determine whether the eggs of the quinnat salmon could be successfully hatched and the fry reared near the city of Sacramento. Of the fish hatched at this station 50,000 were marked.

Nearly all of the fry that were liberated in the Sacramento River were floated in a screen cage by boat into the middle of the stream and there released. N. B. Scofield took 500 in a floating box down the river, where they were held and fed for several weeks in brackish and salt water. They were apparently not affected by the changes in the salinity of the water.

Experiments were carried on until the summer of 1913, when they were abandoned due to the killing of the embryos by the mineral substances in the water used at the station.

During the fiscal year 1912 the Mill Creek hatchery of the United States Bureau of Fisheries was operated by the California Commission.

Some years ago the town of Ukiah, Mendocino County, established a hatchery 1 mile from the town, and on Russian River. For some years it was operated as a trout station, but eventually became an important steelhead hatchery. It was not operated in 1913. In 1914 the State Fish Commission collected steelhead eggs at the Eel River dam of the Snow Mountain Water & Power Co., and having secured permission from the town of Ukiah, hatched them out in its hatchery.

As the Hornbrook hatchery on Klamath River was on private property, the United States Bureau of Fisheries in 1915 removed the buildings from the old location on the south side to property owned by the Government on the north side of the river.

In 1915 new hatchery buildings were erected at the Mill Creek hatchery.

OUTPUT.

The following tables show separately the quantity of eggs, fry, etc., distributed by the United States Fish Commission and the State since the inception of the work. The large quantity of eggs shown by the Commission represents largely the eggs supplied to the State, which hatched and distributed them, and eggs sent to other States and to foreign countries.

OUTPUT OF HATCHERIES OWNED BY THE UNITED STATES BUREAU OF FISHERIES.

Years ending June 30 [a]—	Chinook.		Silver.		Steelhead trout.		Total.	
	Eggs.	Fry.	Eggs.	Fry.	Eggs.	Fry.	Eggs.	Fry.
1872	30,000						30,000	
1873	1,400,000						1,400,000	
1874	4,155,000	850,000					4,155,000	850,000
1875	6,250,000	1,750,000					6,250,000	1,750,000
1876	5,065,000	1,500,000					5,065,000	1,500,000
1877	4,983,000	2,000,000					4,983,000	2,000,000
1878	7,810,000	2,500,000					7,810,000	2,500,000
1879	4,250,000	2,300,000					4,250,000	2,300,000
1880	3,800,000	2,000,000					3,800,000	2,000,000
1881	4,300,000	3,100,000					4,300,000	3,100,000
1882		3,991,750						3,991,750
1883		776,125						776,125
1889 [b]	3,450,000	1,500,000					3,450,000	1,500,000
1890	1,554,000	84,000					1,554,000	84,000
1891	2,988,000	777,000					2,988,000	777,000
1892	2,902,000	315,500					2,902,000	315,500
1893	3,530,000	1,190,100					3,530,000	1,190,100
1894	7,500,000	438,500		280,000	75,000	308,500	7,575,000	1,027,000
1895	3,676,000	500,000		[c] 1,250,000		[d] 1,184,500	3,676,000	2,934,500
1896	6,170,800	715,700			175,000	107,808	6,345,800	823,508
1897	18,232,500	3,056,701		298,137	50,000	257,000	18,282,500	3,611,838
1898	30,605,000	15,643,300			60,000	650,000	30,665,000	16,293,300
1899	27,065,000	3,275,110					27,065,000	3,275,110
1900	2,925,000	3,533,950					2,925,000	3,533,950
1901	3,934,036	889,570					3,934,036	889,570
1902	17,580,410	2,115,500					17,580,410	2,115,500
1903	11,275,777	1,618,066					11,275,777	1,618,066
1904	64,508,354	2,350,130					64,508,354	2,350,130
1905	96,025,765	7,561,380					96,025,765	7,561,380
1906	107,905,945	[e] 3,496,405					107,905,945	3,496,405
1907	73,376,315	2,512,250					73,376,315	2,512,250
1908	64,990,550	4,780,855					64,990,550	4,780,855
1909	32,278,265	3,590,078					32,278,265	3,590,078
1910	30,539,467	2,286,257					30,539,467	2,286,257
1911	33,364,514	3,666,061	2,289,900				35,654,414	3,666,061
1912	20,607,550	7,243,325					20,607,550	7,243,325
1913	17,092,873	2,195,100	100,000	17,320			17,192,873	2,212,420
1914	25,373,645	[f] 9,448,340	95,840	2,536,460			25,469,485	11,984,800
1915	20,716,005	[g] 13,101,539		[h] 1,197,902			20,716,005	14,299,441
Total	772,990,861	118,652,652	2,485,740	5,579,819	360,000	2,507,808	775,836,601	126,740,279

[a] The calendar year was used up to 1889.
[b] The hatchery was closed from 1884 to 1888.
[c] Includes 560,000 fingerlings, yearlings, or adults.
[d] Includes 332,000 fingerlings, yearlings, or adults.
[e] Includes 138 fingerlings, yearlings, or adults.
[f] Includes 3,840,901 fingerlings.
[g] Includes 5,086,130 fingerlings.
[h] Includes 226,162 fingerlings.

OUTPUT OF HATCHERIES OWNED BY THE STATE OF CALIFORNIA.

Years.	Chinook.		Silver fry.	Steelhead fry.	Total.	
	Eggs.	Fry.[a]			Eggs.	Fry.
1873		520,000				520,000
1874		850,000				850,000
1875	[b] 250,000	2,350,000			250,000	2,350,000
1876		2,000,000				2,000,000
1877		2,200,000				2,200,000
1878		2,500,000				2,500,000
1879		2,300,000				2,300,000
1880		2,225,000				2,225,000
1881		2,420,000				2,420,000
1882		3,991,750				3,991,750
1884		600,000				600,000
1886		150,000				150,000
1887		200,000				200,000
1888		1,290,000				1,290,000
1889		2,168,000				2,168,000
1890		1,320,000				1,320,000
1891		2,798,000				2,798,000
1892		2,651,000				2,651,000
1893		3,941,650				3,941,650
1894		7,776,400				7,776,400
1895		3,435,000				3,435,000
1896		15,283,183				15,283,183
1897		18,123,000				18,123,000
1898		31,476,388				31,476,388
1899		21,234,000				21,234,000
1900		2,536,000				2,536,000
1901		3,230,000				3,230,000
1902		16,852,040		301,000		17,153,040
1903		20,040,487		120,000		20,160,487
1904		63,632,000		90,000		63,722,000
1905		87,000,000		108,000		87,108,000
1906		105,815,920		243,000		106,058,920
1907		71,267,000		352,000		71,619,000
1908		60,619,000		170,000		60,789,000
1909		28,000,000		517,000		28,517,000
1910		28,469,745		637,800		29,107,545
1911		29,657,263	2,060,910	1,858,100		33,576,273
1912		18,909,445		2,177,958		21,087,403
1913		16,277,227	25,000	1,983,500		18,285,727
1914		25,290,615	12,500	3,171,083		28,474,198
1915		33,313,150	1,417,000	8,582,500		43,312,650
Total	250,000	744,622,263	3,515,410	20,311,941	250,000	768,449,614

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[a] The greater part of the output of chinook fry was from eggs supplied by the United States Bureau of Fisheries hatcheries in California.

[b] All were lost.

DISTRIBUTION.

The following table shows, by streams and species, the distribution in California of the eggs, fry, etc., from the hatcheries of the United States Fish Commission and the State. This far from represents the work of the hatcheries, as large quantities of eggs were sent to other States and foreign countries.

DISTRIBUTION OF SALMON EGGS, FRY, ETC., IN THE WATERS OF CALIFORNIA.

Years.	Klamath River and tributaries.				Redwood Creek and tributaries.			
	Chinook.		Silver.		Chinook fry.	Silver.		Steelhead fry.
	Fry.	Yearlings.	Fry.	Adults and yearlings.		Fry.	Adults and yearlings.	
1890	90,000							
1891	30,000				25,000			
1892	147,600	25,000			142,500			
1893	487,200				170,000			
1895			300,000	160,000				
1896						140,000	400,000	
1897					65,700			107,808
1898	16,000				280,250	124,750		202,000
1899	40,000				1,260,000			650,000
1911			2,060,910					
1913			17,320					
1914	[a] 2,255,100		2,548,960					
1915	5,820,000		1,098,000					
Total	8,885,900	25,000	6,025,190	160,000	1,943,450	264,750	400,000	960,808

[a] Includes 100,000 planted in Smith River.

DISTRIBUTION OF SALMON EGGS, FRY, ETC., IN THE WATERS OF CALIFORNIA—Con.

Years.	Mad River and North Fork.			Eel River.		Russian River.	Skaggs Springs.	Marin County creeks.
	Chinook fry.	Silver fry.	Steelhead fry.	Chinook fry.	Steelhead fry.	Chinook fry.		
1891						15,000	15,000	
1894		280,000	308,500					
1895		470,000						
1897	145,365	173,287	60,000					635,000
1898				7,857,288				1,970,000
1899				8,202,000				900,000
1900				885,000				
1902				2,069,500	301,000			
1903				5,257,947	120,000			
1904				5,200,000	90,000			
1905				8,100,000				
1906				9,265,920	243,000			
1907				7,570,000	352,000	25,000		25,000
1908				6,154,000				
1909				5,500,000	349,000			
1910				5,989,745	334,800			
1911								
1912	100,000			3,108,660				
1913	100,000			1,286,500				
1914	225,000			3,723,000				
1915	250,000			2,618,150				
Total	820,365	923,287	368,500	82,802,810	1,789,800	40,000	15,000	3,530,000

DISTRIBUTION OF SALMON EGGS, FRY, ETC., IN THE WATERS OF CALIFORNIA—Con.

Years.	Sacramento River and tributaries.					San Francisco Bay streams	San Gregorio River.	Pescadero Creek.	Monterey Bay and tributaries.
	Chinook.			Silver fry.	Steelhead fry.	Chinook fry.			
	Eggs.	Fry.	Yearlings, fingerlings, and adults.						
1873	20,000	520,000							
1874		850,000							
1875	[a] 250,000	2,000,000							
1876		2,000,000							
1877		2,200,000							
1878		2,500,000							
1879		2,300,000							
1880		2,225,000							
1881		2,300,500				20,000	15,000	15,000	30,000
1882	80,300	3,991,750							
1884		600,000							
1886		150,000							
1887		200,000							
1888		1,290,000							
1889		3,668,000							
1890		1,404,000							
1891		3,520,000							
1892		2,676,500							
1893		4,474,750							
1894		8,214,900			45,000				
1895		3,935,000							
1896		15,683,183	250,000						
1897		19,264,086							
1898		23,998,300							
1899	85,200	16,307,110							
1900		5,184,950							
1901		4,128,570							
1902		16,898,100							
1903		16,350,606							
1904		60,782,130							
1905		94,561,360			108,000				
1906		100,038,562							900,000
1907		66,209,250			125,000				1,200,000
1908		50,245,866			170,000				800,000
1909		26,000,000			168,000				
1910		24,786,257			313,000				
1911		33,323,334							
1912		22,948,110							
1913		16,661,167				294,660			
1914		24,037,984	828,906						
1915		26,706,000	9,063,635	1,194,702					
Total	435,500	736,864,194	10,142,541	1,194,702	929,000	314,660	15,000	15,000	2,930,000

[a] All were lost.

DISTRIBUTION OF SALMON EGGS, FRY, ETC., IN THE WATERS OF CALIFORNIA—Con.

Years.	Monterey Bay and tributaries.		Truckee River.	Total.					
				Chinook.			Silver.		
	Silver fry.	Steelhead fry.	Chinook fry.	Eggs.	Fry.	Yearlings, fingerlings, and adults.[a]	Fry.	Adults and yearlings.	Steelhead fry.[b]
1873				20,000	530,000				
1874					850,000				
1875			250,000	250,000	3,250,000				
1876					2,000,000				
1877					2,200,000				
1878					2,500,000				
1879					3,300,000				
1880					2,225,000				
1881			10,000		2,420,500				
1882				80,300	3,901,780				
1884					600,000				
1886					150,000				
1887					200,000				
1888					1,300,000				
1889					3,068,000				
1890					1,494,000				
1891					3,575,000				
1892					2,986,000	25,000			
1893					5,121,900				
1894					8,214,900		260,000		353,500
1895					3,935,000		910,000	540,000	
1896					15,748,883	250,000			107,856
1897					20,324,701		298,137		262,000
1898					45,101,088				650,000
1899				85,200	26,409,110				
1900					6,089,950				
1901					4,126,570				
1902					18,967,000				301,000
1903					21,657,553				120,000
1904					65,982,120				90,000
1905					102,061,389				108,000
1906					110,204,473				243,000
1907	80,000				75,029,280		90,000		487,000
1908	80,000				66,199,855		90,000		170,000
1909	42,000	1,200			31,380,000		42,000		518,200
1910					30,756,000				637,800
1911					33,323,324		2,056,910		1,868,100
1912					26,182,770				2,177,958
1913	25,000				18,472,327		42,320		1,993,500
1914					30,840,964	828,906	2,548,960		3,171,088
1915	71,000				[c] 37,543,150	9,063,635	2,363,782		8,892,800
Total	298,000	1,200	260,000	435,500	[c]828,646,379	10,167,541	8,706,089	540,000	21,821,449

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[a] Of recent years it has been impossible to show the total number of yearlings, fingerlings, and adults planted, as the State reports do not distinguish them from the fry. Those shown in 1914–15 were reared by the United States Bureau of Fisheries.

[b] After 1911 the practice of showing waters in which steelheads were planted was abandoned as the number of streams was becoming unwieldy.

[c] Includes 25,000 chinook fry placed in Santa Ines River and 25,000 placed in Ventura River in 1915.

OREGON.

HATCHERIES ON COASTAL STREAMS.

Rogue River.—In 1877 R. D. Hume, who had been packing salmon on this river for some years, erected a hatchery at Ellensburg. In 1888 the Oregon Legislature appropriated a sum of money for the enlargement and support of this hatchery, Mr. Hume to retain complete control. As the location is on tidewater, it is necessary to catch the parent fish and hold them until they are ready to spawn, and in order to do this Mr. Hume had an excavation 32 by 62 feet and 11 feet deep made in the bank of the river. This was lined with concrete 1 foot thick, which, when filled with water, made a pond 30 by 60 feet and 10 feet deep. Over the entire pond he constructed a building which could be closed up so as virtually to exclude the light. It is supposed that retaining the fish in a dark place aids in keeping them in good physical condition until ready to spawn. After the death of Mr. Hume in 1908 this hatchery was taken over and operated by the State.

In 1897 Mr. Hume built and equipped a hatchery on the upper Rogue River at the mouth of Elk Creek, about 26 miles from the town of Central Point, in Jackson County, and, in pursuance of an understanding with the United States Fish Commission, the latter operated then and still continues to operate this plant.

In 1900 the Government established an auxiliary station for the collection of steelhead trout eggs on Elk Creek, about 10 miles above the main station. In 1905 a substation was operated at Grants Pass, while during the fiscal year 1908 and in subsequent years substations were operated at Findley Eddy, on the Rogue River, Illinois River, and Applegate Creek, tributaries of the Rogue.

Many of the eggs gathered at the upper Rogue River stations were shipped to Mr. Hume's hatchery, on the lower river, and there hatched out and planted.

Coquille River.—The State formerly had a hatchery on this river, but it was abandoned during the winter of 1902–3. In the winter of 1904–5 a substation was established on one of the tributaries of the Coquille River, about 6 miles from the South Coos River hatchery, and was used in hatching eggs brought to it from the latter place. A station was built on the north fork of the Coquille River in 1910.

Coos River.—A hatchery was built by the State in 1900 on the South Coos River, about 20 miles from the town of Marshfield.

Umpqua River.—In 1900 the State built a hatchery on the north fork of the Umpqua River, near the town of Glide and about 24 miles east of Roseburg. In 1901 a station was established farther up the north fork, at the mouth of Steamboat Creek. After working here two years the station was moved a couple of miles farther up the stream. In 1907 work was resumed at the original station near Glide, as winter freshets had seriously damaged the upper station. A permanent station was built in 1910.

Siuslaw River.—In 1893 the State erected a hatchery on Knowles Creek, a tributary of the Siuslaw River, about 20 miles above the mouth of the river. It was turned over to the United States Fish Commission to operate, but no fish came up to the hatchery because the fishermen lower down stretched their nets entirely across the river.

In 1897 and 1898 the United States Fish Commission operated a hatchery owned by a Mr. McGuire and located close to Mapleton about 2 miles below the head of tidewater.

In 1902 the State established an experimental station at the Bailey place, near Meadow post office. In 1907 a permanent station was established by the State on Land Creek fork of the Siuslaw River.

Alsea River.—In 1902 the State established a station on the Willis Vidito place, near the town of Alsea. In 1907 an experimental station was established on this river at the mouth of Rock Creek, about 14 miles above the head of tidewater. In 1910 an experimental station was established between Alsea and tidewater.

Yaquina River.—In 1902 the State established a hatching station on the Big Elk River, a tributary of Yaquina River, about 3 miles above its confluence with the main river. This station was made permanent the next year.

Tillamook Bay.—In 1902 the State established a station on Wilson River, a tributary of Tillamook Bay, and about 8 miles above tidewater. In 1906 the station was removed to the Trask River, a tributary of Tillamook Bay.

DISTRIBUTION.

The following table shows the distribution of fry in the coastal streams of the State by the Government and the State:

DISTRIBUTION OF SALMON FRY, ETC., IN THE COASTAL STREAMS OF OREGON.

Year ending June 30—	Tillamook Bay and tributaries.			Yaquina River.			Alsea River.	
	Chinook fry.	Silverside fry.	Steelhead fry.	Chinook fry.	Silverside fry.	Steelhead fry.	Chinook fry.	Silverside fry.
1898	19,994							
1901				213,500				
1903	251,875			557,700			67,780	
1904	799,300			3,144,380	985,220			
1905				1,407,470	3,009,675	780,500	1,000,000	1,000,000
1906				816,608	4,178,000	1,033,150	806,998	1,785,351
1907	312,700	2,848,000		1,919,508	1,965,793	376,245		
1908	2,124,000	1,629,000		2,193,043	909,855		190,700	812,300
1909		4,836,000	569,620	485,500	1,006,309			
1910	624,800	3,506,990	2,309,770	324,038	28,815			
1911	1,818,245	1,080,000	1,196,000	582,785	2,637,550	621,015	495,950	30,300
1912	646,300	1,578,131	761,000	148,992	1,554,602	7,145	287,645	997,455
1913	1,747,530	422,886	848,229	727,567	3,288,650		57,925	424,925
1914	487,002	1,112,392	660,588					
1915	2,833,428		213,900					
Total	11,665,809	16,873,399	6,559,177	12,521,091	19,553,869	2,818,055	2,945,918	5,050,331

Year ending June 30—	Siuslaw River.			Umpqua River.		Coos Bay and tributaries.		
	Chinook fry.	Silverside fry.	Steelhead fry.	Chinook fry.	Steelhead fry.	Chinook fry.	Silverside fry.	Steelhead fry.
1897	180,000							
1898	440,275							
1899	2,700,000							
1901	213,500			730,000		235,000		
1902	112,000	214,900		1,136,000		2,416,350		
1903	389,239			1,596,213				
1904	822,567			1,390,860		4,079,274		
1905	435,162	311,900		2,654,925		3,877,172		
1906	1,826,581	1,296,732	397,355	4,903,700		2,744,000		
1907	608,940	1,030,486		4,685,900		4,014,400		
1908	729,130	1,127,298		2,378,853		3,000,000		
1909	191,267	1,002,540	98,243	4,093,848		2,084,500	1,032,000	222,000
1910	273,352	25,250		5,686,273		1,683,738		
1911	594,702	20,603	227,580	2,541,236	293,906	2,374,200		
1912	715,758	504,429	72,097	1,063,516		1,767,170	2,317,370	
1913	255,028	627,312	106,717	903,704	181,085	1,281,120	962,528	
1914	1,062,546	476,273	17,735	1,882,985	80,000	1,331,217	2,973,390	
1915	1,472,410		257,850	1,333,171		1,212,805	1,551,645	192,625
Total	13,022,416	6,727,747	1,177,577	36,980,184	555,081	32,100,946	8,836,923	414,625

DISTRIBUTION OF SALMON FRY, ETC., IN THE COASTAL STREAMS OF OREGON—Con.

Year ending June 30—	Coquille River.		Rogue River and tributaries.			
	Chinook fry.	Silverside fry.	Chinook.		Silverside fry.	Steelhead fry.
			Fry.	Yearlings, fingerlings, and adults.		
1877	....	....	50,000	....	....	....
1898	....	....	1,910,045	....	....	....
1900	....	....	2,186,945	....	....	....
1901	235,000	....	2,907,058	....	128,000	65,850
1902	....	....	4,750,768	....	424,530	20,250
1903	3,084,577	....	3,480,300	....	680,800	....
1904	1,000,000	....	9,028,428	....	....	8,073
1905	2,210,000	....	4,758,683	....	1,250,432	321,000
1906	2,978,700	....	47,500	75,000	....	12,025
1907	2,840,000	....	5,880,290	....	1,375,000	165,300
1908	2,450,000	226,600	6,597,037	170,051	158,000	987,680
1909	....	1,185,800	771,710	....	643,000	878,347
1910	....	....	1,430,202	....	....	90,850
1911	500,000	980,770	1,364,248	....	501,081	2,302,865
1912	196,855	1,672,850	9,874,340	....	2,355,855	[a] 1,313,890
1913	496,680	962,528	4,169,150	....	3,198,346	2,795,075
1914	491,580	1,331,910	3,752,483	....	[b] 7,832,000	1,376,308
1915	495,333	1,365,815	4,747,023	9,309	2,336,359	[c] 3,908,600
Total	16,978,725	7,726,273	67,431,855	254,360	20,883,403	11,966,637

Year ending June 30—	Total.				Grand total, all species.
	Chinook.		Silverside fry.	Steelhead fry.	
	Fry.	Yearlings, fingerlings, and adults.			
1877	50,000	....	....	....	50,000
1897	180,000	....	....	....	180,000
1898	2,370,314	....	....	....	2,370,314
1899	2,700,000	....	....	....	2,700,000
1900	2,156,945	....	....	....	2,156,945
1901	4,594,058	....	128,000	65,850	4,787,908
1902	8,415,113	....	639,330	20,250	9,074,693
1903	9,427,654	....	680,800	....	10,108,454
1904	20,268,809	....	985,220	8,073	21,262,102
1905	16,343,382	....	5,571,407	1,311,500	23,226,289
1906	14,123,977	75,000	7,260,083	1,443,130	22,902,190
1907	20,261,747	....	7,009,279	481,545	27,752,571
1908	19,671,755	170,051	4,863,048	987,680	25,692,534
1909	7,626,825	....	9,855,640	1,768,780	19,251,254
1910	10,022,498	....	3,561,094	2,399,615	15,983,207
1911	10,071,364	....	5,250,394	4,381,258	20,263,014
1912	14,390,576	....	10,980,722	2,164,122	27,535,420
1913	9,068,714	....	10,300,012	3,031,106	22,399,832
1914	8,906,303	....	13,725,966	2,134,031	24,766,300
1915	12,094,772	9,309	5,253,819	4,573,074	21,930,974
Total	193,343,799	254,360	86,054,822	26,100,627	305,823,608

[a] Includes 177,790 fingerlings, yearlings, and adults.
[b] Includes 860,903 fingerlings, yearlings, and adults.
[c] Includes 27,258 fingerlings.

The following tables show the total output of the hatcheries in Oregon owned by the United States Bureau of Fisheries and the State of Oregon:

OUTPUT OF HATCHERIES OWNED BY THE UNITED STATES BUREAU OF FISHERIES.

Year ending June 30—	Chinook.			Silverside.		
	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
1889		4,500,000				
1890	1,000,000	2,776,475				
1891	700,000	4,901,525				
1892		1,332,400				
1893		4,100,000				
1894		213,000				
1895	23,000					
1896		[a] 2,832,150	[b] 557,150			
1897		4,922,634				
1898		16,915,512				
1899	27,000	4,300,200				
1900	1,800,000	4,126,367			146,824	
1901	1,100,000	1,669,857	1,608		128,000	
1902	1,866,000	11,587,061			424,530	
1903	4,884,400	5,453,860	250	680,800		
1904	3,113,000	15,270,675				
1905	30,000	9,822,636			1,250,432	
1906	28,200	2,454,371	122,960			300
1907	1,661,300	8,542,104				
1908	2,045,000	7,844,827	627,856		158,000	57,932
1909	3,531,000	5,021,655	2,763		1,799,915	
1910	3,953,902	4,220,197	225			
1911	800,000	5,635,168	200,000		1,650,681	
1912	8,000,000	12,837,840	750,765		2,355,885	
1913	21,491,000	11,291,023			3,198,346	
1914	1,075,000	12,156,818	602,300		8,441,642	27,258
1915	37,000	10,434,517	531,351	76,200	2,373,559	
Total	56,965,982	175,213,872	3,397,306	757,000	21,936,814	85,490

Year ending June 30—	Steelhead trout.			Total.		
	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
1889					4,500,000	
1890				1,000,000	2,776,475	
1891				700,000	4,901,525	
1892					1,332,400	
1893					4,100,000	
1894					213,000	
1895				23,000		
1896					2,832,150	557,150
1897					4,922,634	
1898					16,915,512	
1899	159,000	12,125		186,000	4,312,325	
1900	415,000	99,000		2,215,000	4,372,191	
1901	246,000	65,850	25,000	1,346,000	1,863,707	26,608
1902	481,000	20,250		2,347,000	12,031,841	
1903	400,000	262,700	62,033	5,965,200	5,716,560	62,283
1904		23,205	11,000	3,113,000	15,293,880	11,000
1905	50,000	534,000		80,000	11,607,068	
1906	10,000	1,294,485	40,383	38,200	3,748,856	163,643
1907	50,000	105,300		1,711,300	8,647,404	
1908	263,725	952,680		2,308,725	8,955,507	685,788
1909	51,468	1,374,308		3,582,468	8,195,878	2,763
1910		2,074,188		3,953,902	6,294,385	225
1911		2,914,789		800,000	10,200,638	200,000
1912		2,005,100	294,000	8,000,000	17,198,825	1,044,765
1913		2,795,075		27,491,000	17,284,444	
1914		2,230,008		1,075,000	22,828,468	629,558
1915	752,000	3,254,275	910,652	865,200	16,062,351	1,442,003
Total	2,878,193	20,017,338	1,343,368	60,601,175	217,168,024	4,826,064

[a] All but 17,000 of these were from eggs received from the California stations.

[b] All raised from eggs received from the California stations.

OUTPUT OF HATCHERIES OWNED BY THE STATE OF OREGON.

Years.	Chinook fry.	Silverside fry.	Steelhead trout fry.	Sockeye fry.	Total.
1877	50,000				50,000
1878	79,620				79,620
1879	1,876,500				1,876,500
1880	1,834,290				1,834,290
1881	2,554,290				2,554,290
1888	1,300,000				1,300,000
1889	4,500,000				4,500,000
1890	990,000				990,000
1891	[a] 792,000				792,000
1895	2,500,000				2,500,000
1896	2,500,000				2,500,000
1899	2,700,000				2,700,000
1900	2,500,000		200,000		2,700,000
1901	7,562,000		245,000		7,807,000
1902	11,220,550	7,957,000	256,327		19,433,877
1903	18,502,072	3,288,600	300,850		22,091,522
1904	[b] 48,730,791	3,974,186	143,840		52,848,817
1905	16,303,249	5,509,065	1,495,735		23,308,049
1906	[c] 27,404,596	7,503,655	1,859,696		36,767,947
1907	[d] 25,156,732	6,446,698	370,245		31,979,665
1908	[e] 21,209,394	5,359,709			26,569,103
1909	[f] 20,108,990	9,212,640	1,403,129		30,724,759
1910	[g] 24,169,365	3,631,827	2,364,120		30,165,312
1911	[h] 19,762,220	4,749,319	4,018,598	[i] 1,488,327	30,018,478
1912	[j] 18,077,971	9,580,497	1,358,742	[k] 1,957,825	30,975,035
1913	[l] 26,623,208	9,879,696	1,136,031	[m] 1,937,134	39,576,069
1914	[n] 21,945,746	5,893,965	758,323	[o] 1,978,140	30,576,174
1915	[p] 27,532,168	2,917,460	4,793,208		35,242,836
Total	358,575,821	85,904,245	20,700,853	7,361,426	472,551,345

[a] Eggs from which hatched obtained from United States Bureau of Fisheries.
[b] 6,826,540 eggs were obtained from United States Bureau of Fisheries.
[c] 7,714,000 eggs were obtained from United States Bureau of Fisheries.
[d] 3,550,000 eggs were obtained from United States Bureau of Fisheries.
[e] 3,020,000 eggs were obtained from United States Bureau of Fisheries.
[f] 6,581,000 eggs were obtained from United States Bureau of Fisheries.
[g] 6,465,300 eggs were obtained from United States Bureau of Fisheries.
[h] 3,950,000 eggs were obtained from United States Bureau of Fisheries.
[i] 1,500,000 eggs were obtained from United States Bureau of Fisheries.
[j] 8,000,000 eggs were obtained from United States Bureau of Fisheries.
[k] 2,000,000 eggs were obtained from United States Bureau of Fisheries.
[l] 2,000,000 eggs were obtained from United States Bureau of Fisheries.
[m] 21,491,000 eggs were obtained from United States Bureau of Fisheries.
[n] 1,000,000 eggs were obtained from United States Bureau of Fisheries.
[o] 2,000,000 eggs were obtained from United States Bureau of Fisheries.
[p] Eggs were obtained from the United States Bureau of Fisheries.

COLUMBIA RIVER AND TRIBUTARIES.

The first fish-cultural work upon the Columbia River and in Oregon was at Clackamas, on the Clackamas River, a tributary of the Willamette River, which empties into the Columbia River about 180 miles from its mouth.

This hatchery was built in 1876 by the Oregon & Washington Fish Propagating Co., which operated it until 1880. In 1887 the State provided for and there was appointed a State fish commission. Almost the first work of the commission was to spend $12,000 appropriated by the legislature to put in repair and operate this hatchery. On July 1, 1888, it was informally turned over to the United States Commission of Fish and Fisheries, which paid over the purchase price, took formal possession in the following winter, and has operated it ever since, with the exception of several years when the building of dams stopped the progress of salmon to the hatchery. During this period a temporary station for the collection of eggs was established on Sandy River, about 15 miles away, and on Salmon River, a tributary of Sandy River, both tributaries of the Columbia River. Some eggs were also brought in from the California hatcheries and hatched at the Clackamas station. In 1901 the hatchery was moved about 4 miles down the river and has since been operated as both a rearing and a collecting station. In 1901 the State established another hatchery on the Clackamas River about 30 miles below the main station and between the north and south forks. In 1904 all were turned over to the United States. In 1915 the hatchery was moved again. In 1907 an experimental station for the collection of eggs of the early variety of chinook salmon was established by the State of Oregon on the Clackamas River below the Portland Railway, Light & Power Co.'s dam at Cazadero, but this was later operated by the United States Bureau of Fisheries. The building of a dam having cut off this station, another was established in 1913 at a point 30 miles distant from Portland.

In 1889 the State established a hatchery in the cannery of F. M. Warren, at Warrendale, in Multnomah County, on the Columbia River, which was operated in that year and in 1890.

In 1895 some of the Oregon salmon packers combined and organized the Columbia River Packers' Propagating Co., which established a hatchery on the upper Clackamas River at the junction of the Warm Springs and the Clackamas and operated it in 1895 and 1896. The Government operated it in 1897 and 1898, after which it was turned over to the State and moved to the opposite side of the river.

In 1898 the collection of steelhead trout eggs was first undertaken on the northwest coast by the State of Oregon on Salmon River, a tributary of the Columbia River, and met with fair success. In March, 1899, the Government sent a party to the falls of the Willamette River, near Oregon City, to collect steelhead eggs, and also operated for this purpose at its substation on the Salmon River, but the latter effort met with failure, as the rack was washed away. This station was turned over to the State on June 15, 1899.

In 1901 the State of Oregon did some experimental work at Swan Falls, on Snake River, the boundary for a considerable distance between Oregon and Idaho. During the winter and early spring of 1902 the State also worked Tucannon River, which is a tributary of Snake River, for steelhead, but met with poor success. Snake River was worked again in 1902 at the foot of Morton Island, which is situated 2 miles above Ontario, in Malheur County. Title to the necessary property was secured from the War Department in 1903 and permanent buildings were erected. It was closed for some years and finally abandoned in 1911.

In 1901 the State of Oregon established an experimental hatchery in Wallowa County, on the Grande Ronde River, at the mouth of a small tributary called the Wenaha River, which enters the main stream about 50 miles from its mouth. A permanent station was established in the canyon about 1½ miles below the Wallowa bridge on the Wallowa River, a tributary of the Grande Ronde River, in 1903.

In 1902 the State of Oregon erected a permanent plant on Salmon River at its junction with Boulder Creek. This plant was closed in 1911.

In the same year the State established an experimental station on the McKenzie River, a tributary of the Willamette River, about one-half mile above Vida post office. This experimental work was resumed in 1905 at a point 2 miles below Gate Creek. The hatchery was permanently established at a spot about 30 miles from Eugene and near the town of Leaburg a year or two later.

In 1903 a hatchery was built by the State of Oregon on the Snake River, near the town of Ontario, in eastern Oregon.

In 1906 an experimental station was established by the State on Breitenbush Creek a short distance above its junction with the Santiam River, a tributary of the Willamette River, but the plant was destroyed, very shortly after its establishment, by a forest fire. An experimental station was reestablished here in 1909, but a heavy freshet raised the river so high that the penned fish escaped around the rack.

In 1909 the State of Oregon built at Bonneville, on Tanner Creek, a tributary of the Columbia River, a large central hatchery capable of handling 60,000,000 eggs, it being the intention of the State to hatch at this plant the eggs collected at other stations.

In the same year a temporary hatchery was located on the Santiam River by the State of Oregon.

During 1910 the State of Oregon received 1,500,000 red-salmon eggs from the Yes Bay (Alaska) hatchery of the United States Bureau of Fisheries, and yearly since they have received a consignment from the same source, as will be noted in the statistical tables. These were hatched out in the Bonneville hatchery and planted in the Columbia River.

The State of Oregon built a hatchery on the Klaskanine River, a tributary of Youngs River, near Olney, in Clatsop County, in 1911. In the same year an eyeing station for spring chinooks was opened by the State on the Willamette River, near Lowell.

The first entrance of Washington (then a Territory) into fish-cultural operations was in 1879, when the State fish commissioner paid the Oregon & Washington Fish Propagating Co., which was operating the hatchery on the Clackamas River, $2,000 for salmon fry deposited in that river. In 1893 the State Legislature established a hatchery fund which was to be supplied by licenses from certain lines of the fishery business. In 1895 its first hatchery in the Columbia River Basin was built on the Kalama River, about 4 miles distant from its junction with the Columbia, and in Cowlitz County. Shortly after this hatchery was built it was discovered that it was above where the salmon spawned, and a second hatchery was built 1½ miles below the first named, as the rugged mountainous character of the country made transportation between the two sites difficult. Of recent years a road has been constructed along the river bank, and it is probable that the upper buildings will be abandoned entirely.

Another station for the collection and eyeing of eggs was established on the Chinook River, a small stream which empties into Baker Bay near the mouth of the Columbia.

During the fiscal year 1897 the United States Fish Commission established a station on Little White Salmon River, a stream which empties into the Columbia, on the Washington side, about 14 miles above the Cascades. During the fiscal year 1901 an auxiliary station was operated on Big White Salmon River, while fishing was carried on in Eagle and Tanner Creeks, in Oregon, the eggs obtained from these creeks being brought to the Little White Salmon hatchery.

In 1899 the State of Washington built and operated hatcheries on the Wenatchee River, a tributary of the Columbia River, about 1½ miles from Chiwaukum station on the Great Northern Railway, and on Wind River, a tributary of the Columbia, about 1 mile from the junction.

In 1900 Washington State hatcheries were established in the Columbia River Basin as follows: White River hatchery, which was built on Coos Creek, which empties into a tributary of the White River, the location being about 2½ miles from where the Green River joins the White River; Methow River hatchery, built on the Methow River at the point where it is joined by the Twisp, about 22 miles from the Columbia River; Colville River hatchery, built on the north bank of Colville River, about 1½ miles from its mouth, and about 1 mile from Kettle Falls; Klickitat River hatchery, located on the east bank of the Klickitat River, about 6 miles from its mouth; and one on the Little Spokane River, about 10 miles from its mouth and about 9 miles north of the city of Spokane. The Klickitat River hatchery never was operated, while most of the others were operated intermittently.

In 1906 a hatchery was established by the State of Washington on the Lewis River, some distance above the town of Woodland.

In 1909 the State of Washington established a hatchery near Pateros, on the Methow River, a tributary of the Columbia River, and on the Tulton.

In 1915 Clarke County, Wash., built a hatchery on the east side of Cold Creek, about 2 miles from the town of Vancouver.

A temporary station was established by the State of Washington on Wenatchee Lake, near Leavenworth, in 1915.

The following table shows the plants of salmon and steelhead trout in the Columbia River and its tributaries by the Bureau of Fisheries and the States of Oregon and Washington:

PLANTS OF SALMON FRY IN THE COLUMBIA RIVER BASIN SINCE 1877.

Years ending June 30—	Columbia River and tributaries.					Total fry.
	Sockeye fry.	Chinook fry.	Silverside fry.	Steelhead trout fry.	Chum fry.	
1877		300,000				300,000
1878		79,630				79,630
1879		3,076,500				3,076,500
1880		1,834,290				1,834,290
1881		2,554,290				2,554,290
1888		1,300,000				1,300,000
1889		4,500,000				4,500,000
1890		3,756,475				3,756,475
1891		5,694,000				5,694,000
1892		1,332,400				1,332,400
1893		4,100,000				4,100,000
1894		213,000				213,000
1895		a2,523,000				2,523,000
1896		b10,389,300				10,389,300
1897		10,641,394				10,641,394
1898		26,212,074				26,212,074
1899		19,979,241		8,625		19,987,866
1900		22,510,869	7,175,824	290,000		29,976,693
1901		c24,978,978	5,559,750	345,000		30,883,728
1902		44,328,065	17,545,724	256,327		62,130,116
1903		40,174,313	8,721,720	d400,583		49,296,616
1904		71,694,587	8,422,085	158,981		80,275,653
1905		17,107,217	1,354,010	e768,835		19,230,062
1906		f36,572,785	g628,872	h1,769,494		38,971,151
1907		23,171,235	2,657,349	26,640		25,855,224
1908		i34,852,008	1,705,548	15,000		36,572,561
1909		j33,098,943	2,439,415	k1,058,657		36,597,015
1910		l37,744,003	3,374,733	m2,063,686		43,182,422
1911	1,468,327	n28,802,795	o1,308,900	1,962,231	480,730	34,[illegible],083
1912	1,957,825	p60,740,935	1,243,000	q1,505,800	106,030	65,553,590
1913	1,937,134	70,211,177	4,591,500	40,000	105,800	76,885,611
1914	1,978,140	r83,727,844	626,900	s942,700	591,638	87,867,222
1915		t82,317,443	606,747	4,128,833	8,290,573	95,354,594
Total	7,361,426	800,318,760	66,175,232	15,857,894	9,522,760	901,237,201

a Includes 23,000 eggs.
b Includes 557,150 yearlings, fingerlings, or adults.
c Includes 1,668 yearlings, fingerlings, or adults.
d Includes 37,033 yearlings, fingerlings, or adults.
e Includes 50,000 eggs.
f Includes 48,200 eggs and 47,980 yearlings, fingerlings, or adults.
g Includes 300 yearlings, fingerlings, or adults.
h Includes 24,383 yearlings, fingerlings, or adults, and 58,000 eggs.
i Includes 1,995,740 yearlings, fingerlings, or adults.
j Includes 16,949 yearlings, fingerlings, or adults.
k Includes 50,000 eggs.
l Includes 225 yearlings, fingerlings, or adults.
m Includes 25,000 eggs.
n Includes 11,700 yearlings, fingerlings, or adults.
o Includes 100,000 eggs.
p Includes 1,406,860 yearlings, fingerlings, or adults.
q Includes 116,300 yearlings, fingerlings, or adults.
r Includes 1,000,000 eggs and 1,733,806 yearlings, fingerlings, or adults.
s Includes 79,000 eggs.
t Includes 812,801 yearlings, fingerlings, or adults.

WASHINGTON.

Willapa River.—In 1899 Washington established a hatchery on Trap Creek, a tributary of the Willapa River, situated about 200 yards from the creek's mouth.

Chehalis River.—The construction of a hatchery on the Chehalis River, about 4 miles above the city of Montesano, was begun by the State in October, 1897, but owing to bad weather and extreme high water was not completed until late in 1898. The hatchery was a failure until 1902 when a fair season was had, as was again true in 1903. It was not operated in 1904. Since the State began taking eggs from the Satsop River, a tributary of the Chehalis, it has been possible to fill the hatchery each season.

In 1909 the site where eggs had been gathered on the Satsop River was purchased, and a new hatchery was erected there. It has three concrete rearing ponds and is fully equipped for the taking of spawn and the hatching out and caring for 5,000,000 fry. This plant was first operated in the fall of 1909.

Work was begun in September, 1914, by the United States Bureau of Fisheries on a hatching station on Lake Quinault, Wash., and a take of eggs was made the same year.

In lieu of installing fishways in their dams in the Humptulips River and tributaries, in the Grays Harbor section, two timber firms agreed to furnish the money needed to build a hatchery on Stevens Creek, west of Humptulips, and the same was constructed and put into operation in October of the same year. The plant is now the property of the State.

Puget Sound and tributaries.—In 1896 the State established a hatchery on Baker Lake, which is the head of Baker River, a tributary of the Skagit River, and this was the first establishment for the hatching of sockeye salmon. In July, 1899, it was sold to the United States Fish Commission. In 1901 steelhead trout eggs were collected on Phinney Creek, about 5 miles from the town of Birdsview, and some 30 miles from Baker Lake. In 1901 an auxiliary station was opened at Birdsview, on Skagit River, and steelhead trout eggs were collected on Phinney and Grandy Creeks and brought to Baker Lake to be hatched.

In 1898 a private hatchery (the necessary money being raised by subscription among the residents of Fairhaven, now Bellingham, and vicinity) was built near Lake Samish, a few miles from Fairhaven.

In 1899 a hatchery was built by the State on Kendall Creek, a tributary of the Nooksak River, about 300 yards from same, and about 2 miles from the railway station of Kendall. Except in 1903, this hatchery has since been operated continuously. An eyeing station was built in 1907 on the south fork of the Nooksak River, about 1 mile from Acme.

In the same year the State built a hatchery on the Skokomish River, about 4 miles from its mouth. An eyeing station was also erected on the north fork of the same river. The main station was not operated in 1904 and only on a small scale in 1903 and 1905.

The State in 1889 built a hatchery on Friday Creek, a tributary of the Samish River, situated about 1 mile from the mouth of the creek.

The following State hatcheries were first operated in 1900: Snohomish hatchery, built on the west bank of Skykomish River, a few miles from its mouth; Nisqually River hatchery, built on Muck Creek, about one-half mile from the Nisqually River, and about 4 miles from the town of Roy, in Pierce County; and the Stillaguamish hatchery, located on the Stillaguamish River, about 4 miles from the town of Arlington, in Snohomish County. The latter has since been moved to Jim Creek, a tributary of the south branch of the Stillaguamish River.

The Startup hatchery, located near Startup, on the Skykomish River, was formerly used as a collecting station for the Snohomish hatchery. It is still used for this purpose, but also retains and hatches a considerable quantity of spawn. The station is about 4 miles from the Snohomish hatchery.

In 1900 the State established a fisheries experimental station at Keyport Landing, on the east arm of Port Orchard Bay, with Pearson as the nearest post office. The work of the station was devoted to salmon and oysters until it was abandoned a few years later.

The State established a hatchery on the Dungeness River, about 7 miles from the town of Dungeness, in Clallam County, in 1901. In 1906 it constructed a hatchery on a small tributary of the Skagit River, between Hamilton and Lyman. The station built on Sauk River, a tributary of the Skagit, has been operated only occasionally since the Skagit hatchery was built.

The White River hatchery was constructed on Suice Creek, a tributary of Green River, some years ago. During the summer of 1909 a new hatchery was built at this station, the old one being too small to accommodate the amount of spawn that could be taken. The new hatchery is located on the east side of Suice Creek near the county road. The building contains 140 hatching troughs. The plant has a pond system, where the fry are kept and fed until they are able to shift for themselves.

During the summer of 1911 the city of Tacoma constructed a large concrete dam in the Green River, about 4 miles west of Eagle Gorge.

As this dam prevented the salmon from reaching the spawning beds, the State established an eyeing station the same year just below the dam. In 1913 the name was changed to Green River hatchery, to conform to the name of the main stream.

In 1912 the United States Bureau of Fisheries completed the Quilcene and Duckabush hatcheries. Both are on small tributaries entering the west side of Hoods Canal, an arm of Puget Sound.

In 1913 a new station was operated by the Bureau on the Dusewallips River, a tributary of Hoods Canal, Puget Sound, near Brinnon. Two new field stations—on Elwell River, a tributary of the Skykomish River, near Sultan, and on Sauk River, a tributary of the Skagit River, near Darrington—were also put into operation the same year. The Sauk River had been worked by the State at one time.

In 1913 the Middle Fork Nooksak eyeing station was transformed into a hatchery. In the same year the eyeing station on the south fork was moved farther up the river.

In 1914 stations were established by the United States Bureau of Fisheries on Day Creek and Illabot Creek, tributaries of the Skagit River, while a substation was opened on Hamahama River at Eldon, distant about 9 miles up Hood Canal from the mouth of the Duckabush River.

On May 23, 1914, the Baker Lake hatchery building was destroyed by fire. In addition to the building and equipment, 1,305,820 silver fry and 823,097 sockeye fry were destroyed. The station has since been rebuilt.

In 1915 the State built a hatchery on the Pilchuck River, a tributary of the Skykomish River, near Granite Falls.

In lieu of building a fishway in its dam on the Elwha River, near Port Angeles, the Olympic Power Co. furnished the funds needed to build a hatchery below the dam, and this was opened by the State in 1915.

The following tables show the total output of the salmon hatcheries in the State of Washington owned by the United States Bureau of Fisheries and the hatcheries owned by the State itself:

OUTPUT OF THE SALMON HATCHERIES IN WASHINGTON OWNED BY THE UNITED STATES BUREAU OF FISHERIES.

Year ending June 30—	Chinook.			Sockeye, or blueback.			Silver, or coho.		
	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
1897		1,848,700							
1898		7,301,896							
1899	4,926,000	1,791,066							
1900	2,686,000	6,626,947			10,683,000				
1901	6,581,000	5,427,680			3,824,453			174,041	
1902		15,637,667			3,371,000				
1903		16,774,000			3,731,719			81,912	
1904	7,506,000	17,288,183			2,865,000			2,964,645	
1905		4,236,276			7,819,281	10,000	107,000	8,071,081	
1906	7,714,000	14,846,905		880,000	3,285,128	9,500	239,150	6,445,574	
1907	3,550,000	6,512,728			4,224,268		700,000	3,636,902	
1908	1,485,000	12,372,585	1,537,941	75,000	8,514,306		296,000	13,282,714	
1909	3,050,000	11,565,558	14,198	100,000	5,430,638		272,000	7,661,110	
1910	3,812,250	9,175,610			4,564,826		275,000	10,998,026	
1911	3,360,000	7,307,455	11,700		3,496,000		192,000	4,550,615	
1912	5,020,000	10,959,720	655,095		4,092,573		52,000	10,880,930	
1913	19,713,000	19,933,300			5,751,700		102,000	10,754,617	
1914	4,584,000	31,140,449	1,130,505	80,000	2,563,499	120,000		13,581,254	
1915	4,996,000	25,162,130	987,485	155,000	10,820,441	46,575	36,000	20,673,056	41,500
Total	81,976,250	239,096,878	4,336,924	1,290,000	98,647,847	186,075	2,240,150	114,275,535	41,500

Year ending June 30—	Humpback.		Steelhead trout.			Chum fry.	Total.		
	Eggs.	Fry.	Eggs.	Fry.	Fingerlings, yearlings, and adults.		Eggs.	Fry.	Fingerlings, yearlings, and adults.
1897								1,848,700	
1898								7,301,896	
1899							4,926,000	1,791,066	
1900				25,000			2,686,000	17,335,947	
1901							6,581,000	9,426,174	
1902				110,000				19,118,667	
1903			80,000	440,000	223,815		80,000	21,027,631	223,815
1904		176,507	255,000	70,000			7,761,000	23,472,435	
1905			414,400	3,205			521,400	28,120,342	10,000
1906	2,000	960,980	348,000	540,000			9,183,150	28,087,588	9,500
1907			260,000	941,505			4,510,000	15,315,486	
1908	502,000	6,764,702	224,000	126,910			2,582,000	41,651,300	1,537,941
1909			220,000	717,601			3,642,000	25,374,907	14,198
1910		1,368,000	300,000	1,457,000			4,387,250	27,423,436	
1911		96,000	560,000	911,640		60,000	4,112,000	16,430,720	11,700
1912		2,566,325	905,000	2,286,315		2,466,000	5,977,000	33,597,890	655,095
1913		1,088	1,330,000	1,477,150		19,470,000	21,145,000	57,307,947	
1914	13,260,000	[a]21,118,378	720,000	1,792,430		5,672,726	18,644,000	78,866,808	1,250,505
1915		6,920,500	125,000	2,008,688	137,665	26,564,707	5,312,000	114,098,541	1,213,225
Total	13,764,000	39,981,425	5,760,400	12,896,566	361,480	54,220,442	105,080,850	561,225,786	4,925,977

[a] Includes 4,266 fingerlings, adults, and yearlings.

OUTPUT OF THE SALMON HATCHERIES OWNED BY THE STATE OF WASHINGTON.

Year ending June 30—	Chinook fry.	Chum fry.	Humpback fry.	Silver, or coho, fry.	Sockeye, or blueback, fry.	Steelhead trout fry.	Total.
1896	4,500,000						4,500,000
1897	4,050,000				5,500,000		9,550,000
1898	4,275,000				5,400,000		9,675,000
1899	8,595,000			189,000			8,784,000
1900	12,251,600	10,301,760		13,778,280		1,735,560	38,067,200
1901	12,275,400	16,478,280		19,747,894		1,398,470	49,900,044
1902	14,786,822	9,937,390		32,934,593		2,491,371	60,150,176
1903	14,283,490	9,937,390		28,668,488		3,124,678	56,014,046
1904	13,261,184		295,200	15,725,198		3,868,866	33,150,448
1905	7,101,188			12,236,294		2,423,638	21,761,120
1906	10,943,550	3,268,800		28,908,380		2,700,784	45,821,514
1907	8,897,670	6,120,000		29,688,000		2,575,942	47,281,612
1908	18,647,600	4,342,350	2,655,900	29,273,202		4,578,678	59,497,127
1909	17,440,950	8,218,000		34,543,200		4,080,450	64,282,600
1910	21,168,350	8,607,500	519,600	30,894,100		4,855,086	66,044,636
1911	16,466,502	13,326,750		33,097,750		5,163,180	68,046,182
1912	23,380,516	4,684,950	370,785	37,164,125		4,982,067	70,422,443
1913	30,542,929	14,711,400		50,268,290		9,080,280	104,602,899
1914	35,539,700	7,842,266	1,532,737	33,494,380	[b] 49,792	3,681,514	82,050,389
1915 [a]	39,784,083	27,458,665	578,504	60,169,474	62,631	3,467,190	131,510,547
Total	318,183,682	145,235,501	5,952,726	479,784,837	11,012,423	61,985,877	1,021,174,416

[a] A considerable proportion of the fry was fed in rearing ponds for some time before planting.

[b] 29,900 eggs were distributed in addition.

NOTE.—As the printed reports of the State before 1913 in many instances report as the output the number of eggs gathered, it has been necessary in such cases to make an arbitrary reduction from these figures, in order to allow for the loss in the egg stage.

The following table shows the plantings made in waters of Washington other than the Columbia River by the United States Bureau of Fisheries and the State of Washington:

PLANTS OF SALMON FRY AND FINGERLINGS IN THE WATERS OF WASHINGTON OTHER THAN THE COLUMBIA RIVER.[a]

Year ending June 30—	Puget Sound and tributaries.					
	Chinook.	Sockeye.	Silver, or coho.	Humpback.	Chum.	Steelhead.
1897		5,500,000				
1898		5,400,000				
1899	7,470,000		189,000			
1900		10,682,000	6,749,280		10,301,760	1,572,8
1901	380,000	3,834,453	14,300,185		16,478,280	1,398,47
1902	2,141,322	3,371,000	23,161,089		9,937,300	2,501,371
1903	2,112,800	3,731,780	21,807,771		9,937,300	[b] 3,326,0
1904	1,965,983	3,855,000	14,071,945	471,797		3,518,47
1905	2,590,738		16,441,375			[c] 1,320,9
1906	4,819,290	[d] 3,582,680	[e] 29,770,414	989,900	1,800,000	[f] 3,177,1
1907	3,907,898		26,980,543	4,224,265	5,220,000	3,964,
1908	8,356,780	8,514,305	37,612,468	9,420,082	2,278,260	4,586,
1909	9,647,288	5,430,636	25,622,310		6,048,000	[g] 4,490,14
1910	11,661,080	4,564,826	36,527,125	1,987,000	7,748,500	6,305,
1911	4,984,452	5,496,000	29,941,865	95,000	12,074,080	4,841,
1912	4,646,254	4,682,573	39,728,614	5,422,110	3,526,170	[h] 6,728,
1913	7,561,328	5,751,700	84,128,207	1,988	31,408,980	9,731,
1914	7,392,828	[i] 2,808,261	42,213,911	[j] 22,061,415	15,535,048	4,444,
1915	15,242,734	7,371,666	74,806,147	7,508,004	51,862,080	4,926,
Total	94,721,412	84,572,328	498,962,138	52,063,725	184,145,956	66,913,

[a] In addition to the waters given, plants of 19,913 chinook, 3,558,891 blueback, or sockeye, 196,966 silver, or coho, and 10,596 steelhead were made in the Quinault River in 1915.

[b] Of these, 218,200 were yearlings, fingerlings, or adults.

[c] Of these, 14,400 were eggs.

[d] Of these, 9,800 were yearlings, fingerlings, or adults.

[e] Of these, 14,840 were yearlings, fingerlings, or adults.

[f] Of these, 15,000 were yearlings, fingerlings, or adults.

[g] Includes 100,000 eggs.

[h] Of these, 25,000 were eggs and 1,000 yearlings, fingerlings, or adults.

[i] Includes 50,000 eggs and 120,000 fingerlings.

[j] Includes 4,385 fingerlings.

PLANTS OF SALMON FRY AND FINGERLINGS IN THE WATERS OF WASHINGTON OTHER THAN THE COLUMBIA RIVER—Continued.

Year ending June 30—	Chehalis River.				Willapa River.			
	Chinook.	Silver, or coho.	Chum.	Steelhead.	Chinook.	Silver, or coho.	Chum.	Steelhead.
1900	1,215,000	....	....	....	....	....	....	....
1901	2,355,300	....	....	....	881,000	....	....	190,000
1902	1,909,800	....	....	....	653,400	....	....	....
1903	....	....	....	....	2,158,019	1,800,000	....	800,000
1904	900,000	....	....	....	819,504	204,570	....	420,390
1905	....	....	....	....	630,000	1,800,000	....	288,000
1906	....	2,563,350	1,468,800	....	529,660	2,180,080	....	171,555
1907	....	2,250,000	900,000	....	303,660	2,260,000	....	526,500
1908	163,000	3,275,000	2,064,000	....	678,000	854,800	....	143,500
1909	148,000	1,800,000	1,757,000	....	322,200	504,000	....	398,000
1910	405,000	1,577,000	859,000	....	455,200	64,000	....	....
1911	111,150	4,041,900	900,980	937,500	734,350	2,457,900	....	300,000
1912	118,750	3,575,700	1,052,760	98,752	748,600	3,111,750	....	303,825
1913	119,700	1,090,200	3,177,080	412,500	729,000	1,288,000	....	382,500
1914	139,000	2,977,280	497,300	701,118	3,267,345	1,785,580	....	248,555
1915	93,250	4,958,440	1,230,000	561,900	302,461	581,730	1,581,750	105,440
Total...	7,675,900	28,739,880	13,907,500	2,706,770	13,288,580	18,760,336	1,581,750	3,984,280

Year ending June 30—	Total by species.						Grand total.
	Chinook.	Sockeye.	Silver, or coho.	Humpback.	Chum.	Steelhead.	
1878	[a]3,000	....	....	....	....	....	3,000
1897	....	5,500,000	....	....	....	....	5,500,000
1898	....	5,400,000	....	....	....	....	5,400,000
1899	8,665,000	....	180,000	....	....	....	8,874,000
1900	3,236,300	10,688,000	6,749,280	....	10,301,700	1,762,560	32,732,900
1901	2,863,200	3,824,453	14,360,185	....	16,478,280	1,388,476	38,934,594
1902	2,141,322	3,371,000	23,161,069	....	9,937,380	2,591,371	41,203,153
1903	4,276,880	3,731,789	23,307,771	....	9,937,289	3,826,091	45,078,010
1904	3,585,437	3,855,000	14,276,721	471,797	....	3,938,896	26,127,831
1905	3,220,738	....	18,241,375	....	....	1,617,940	28,080,053
1906	5,348,940	3,562,030	34,493,794	909,995	3,208,800	3,345,734	51,012,878
1907	4,301,258	....	31,460,552	4,224,255	6,120,000	4,490,808	50,596,873
1908	9,198,300	8,514,305	41,542,986	9,420,082	4,342,350	4,714,991	77,732,555
1909	10,117,488	5,430,626	30,928,310	....	7,805,000	4,898,141	63,177,565
1910	12,520,280	4,554,825	38,478,125	1,897,000	8,607,500	6,292,328	72,350,648
1911	5,829,962	5,496,000	38,441,665	96,000	12,975,020	6,078,830	68,917,497
1912	5,513,604	4,692,573	46,476,064	5,432,110	4,578,930	7,131,382	73,824,663
1913	8,410,628	5,751,700	50,204,407	1,898	34,598,640	10,528,400	118,481,663
1914	10,779,171	2,803,261	46,976,751	22,651,415	16,032,346	5,382,944	104,636,898
1915	15,658,356	10,929,647	80,275,288	7,508,004	54,668,800	5,635,498	174,623,565
Total........	115,705,864	88,120,809	546,561,318	52,663,721	190,635,206	73,614,255	1,076,311,288

[a] These were brought from the Clackamas (Oreg.) station and planted in some unnamed lake.

BRITISH COLUMBIA.

Fraser River.—The first hatchery established by the Dominion of Canada on the Pacific coast was erected in 1884 at what is now Bon Accord, a point on the lower river some 4 miles above New Westminster, and on the opposite shore. The next built was in 1901 on Granite Creek, Shuswap Lake, which discharges into the Fraser through the South Thompson River, the lake being about 280 miles from New Westminster. In 1904 another hatchery was established on Harrison Lake on the Lillooet River, first large tributary of the Fraser on the north side; also one about 4 miles east of the lower extremities of Pemberton Meadows, at the junction of Owl Creek and the Birkenhead River, 4 miles above its confluence with the eastern branch of the Lillooet River, which in turn discharges into Lillooet Lake. In 1907 a hatchery was built on Stuart Lake, near the headwaters of the Fraser.

In 1914 the Bon Accord hatchery had to be abandoned, due to the laying out of a town site around it, and the equipment was transferred to Queen's Park, New Westminster.

The Province of British Columbia owns Seton Lake hatchery, which was established in 1903 on Lake Creek, on the north side, about half a mile from the outlet of Seton Lake, and it has been operated continuously ever since. Seton Lake is a part of the Fraser River chain and is some 300 miles above the mouth of the river. Lake Creek, the outlet of Seton Lake, empties into the Cayoosh Creek, a tributary of the Fraser, 45 miles north of the latter's junction with the Thompson, and 1 mile south of the town of Lillooet.

Nimpkish River.—In 1902 S. A. Spencer, of the Alert Bay cannery (now belonging to the British Columbia Packers Association), in return for certain special fishery privileges granted by the Dominion, established a hatchery on this river, which is located on the northeast shore of Vancouver Island. The hatchery was burned down in 1903, but was immediately rebuilt. Since its establishment it has been operated by the Dominion.

Rivers Inlet.—A hatchery was established by the Dominion on McTavish Creek, one of the tributaries of Oweekayno Lake, about 20 miles up Rivers Inlet, in 1905, and has been operated ever since.

Skeena River.—In 1902 the Dominion established a hatchery on Lakelse Lake, in the Skeena River Basin, about 65 miles up the river from Port Essington. In 1907 another was constructed on Babine Lake, the source of the Skeena River.

In 1910 the Dominion put three new hatcheries into operation, all on Vancouver Island. They were located on Anderson Lake, Kennedy Lake, and Cowichan Lake, respectively. The two former are used for sockeyes and the latter for king and coho salmon and steelhead and other varieties of trout.

In 1913, the year of the quadrennially big run of sockeye salmon on the Fraser River, the contractors who were building the new Canadian Northern Railway, in blasting their way along the banks of the river, threw the rock and other débris into the stream until in the narrow part of the canyon south of North Bend at Whites Creek, Hells Gate, China Bar, and Scuzzy Rapids, all within a few miles of each other, the débris formed great sloping banks extending out into the stream at these points, and entirely changed the direction of the currents, and of course, the velocity of the water. At best the salmon had a hard time getting through there, but the added obstructions rendered it practically impossible.

At a rather late hour the authorities woke up to the menace this work was to the run of salmon, and the dumping of débris into the river in such a manner as to obstruct their ascent was stopped.

How to clear the stream once more was now the problem, and this was seriously complicated by a slide of rock which took place in Hells Gate in February, 1914, which narrowed the channel of the stream considerably.

In March, 1914, the Dominion Marine and Fisheries Department contracted with a private concern to remove the obstructions, and this was done from Scuzzy Rapids, China Bar, and Whites Creek entirely within a short period of time, but a couple of seasons' work were required to clear up Hells Gate so as to permit of easy passage for the fish.

The following table shows the plantings made in the waters of British Columbia from the Dominion and provincial hatcheries:

PLANTS OF SALMON FRY MADE IN THE WATERS OF BRITISH COLUMBIA.

Years.	Fraser River.[a]						
	Chum.	Coho, or silver.	Spring, or king.	Humpback.	Sockeye.	Steelhead trout.	Total.
1885					1,800,000		1,800,000
1886					2,625,000		2,625,000
1887					4,414,000		4,414,000
1888					5,807,000		5,807,000
1889					4,419,000		4,419,000
1890					6,640,000		6,640,000
1891					3,008,800		3,008,800
1892					6,000,000		6,000,000
1893					5,674,000		5,674,000
1894					6,300,000		6,300,000
1895					6,380,000		6,380,000
1896					10,383,000		10,383,000
1897					5,928,000		5,928,000
1898					5,850,000		5,850,000
1899					4,742,000		4,742,000
1900					6,200,000		6,200,000
1902 [b]		90,000			15,898,000	75,000	15,973,000
1903	75,000	1,730,000	22,000		12,521,000		14,348,000
1904		210,000		50,000	13,729,200	12,000	14,001,200
1905		5,576,100	4,381,400		9,244,300		19,201,800
1906		4,774,000	1,791,500		100,479,000	4,000	107,048,500
1907		3,219,200	1,814,900		36,965,900		42,000,000
1908		5,890,000	2,815,000	22,500,000	51,855,200		83,060,200
1909		7,375,400	5,772,400		41,909,500		55,057,300
1910		450,000	6,300,000		105,312,500		112,062,500
1911		5,117,800	2,120,500		24,146,300		31,384,600
1912		3,899,500	5,962,500	28,773,350	34,183,900		72,819,250
1913	1,100,000	1,995,600	4,523,550		41,062,700		48,681,850
1914		1,522,000	50,000	500,000	92,308,000		94,380,000
1915	125,000	2,196,000	2,614,700		27,496,000		32,431,700
Total	1,300,000	44,216,650	38,187,450	51,823,350	694,857,200	91,000	830,475,650

[a] Some of the reports from the provincial hatchery at Seton Lake show merely the take of eggs; it has been necessary to make an arbitrary reduction in order to show the loss of eggs and fry before planting.

[b] No plants made in 1901.

PLANTS OF SALMON FRY MADE IN THE WATERS OF BRITISH COLUMBIA—Continued.

Years.	Skeena River.			Rivers Inlet.			Nimpkish River.
	Humpback.	Sockeye.	Total.	Spring, or king.	Sockeye.	Total.	Sockeye.
1903		3,450,000	3,450,000				1,636,000
1904		4,000,000	4,000,000				2,496,000
1905		3,767,900	3,767,900				2,550,000
1906		3,784,450	3,784,450		8,000,000	8,000,000	4,973,400
1907		4,125,750	4,125,750		8,440,000	8,440,000	4,570,000
1908		8,946,950	8,946,950	4,706,000	8,594,000	13,300,000	4,500,000
1909		11,882,400	11,882,400		13,300,000	13,300,000	4,500,000
1910		*11,521,700	11,521,700		12,750,000	12,750,000	6,055,000
1911		12,556,470	12,556,470		11,436,000	11,436,000	6,414,000
1912		12,367,500	12,367,500		11,791,000	11,791,000	5,114,500
1913		11,430,430	11,430,430		10,981,000	10,981,000	4,981,000
1914		11,843,200	11,843,200		12,397,000	12,397,000	5,053,000
1915	16,000	11,899,613	11,915,613		12,712,000	12,712,000	4,580,000
Total	16,000	111,576,363	111,592,363	4,706,000	110,401,000	115,107,000	57,822,900

Years.	Vancouver Island.					
	Chum.	Coho, or silver.	Spring, or king.	Sockeye.	Steelhead trout.	Total.
1911	40,000	4,550,000	425,000	7,862,000	145,200	13,022,200
1912		3,487,500	456,000	13,620,750	37,200	17,601,450
1913		3,180,000	712,500	15,031,750	173,900	19,098,150
1914		2,252,000	701,000	15,314,500	87,200	18,354,700
1915		2,229,220	250,000	15,911,000	55,000	18,445,220
Total	40,000	15,698,720	2,544,500	67,740,000	498,500	86,522,320

* Includes 80,000 coho fry.

PLANTS OF SALMON FRY MADE IN THE WATERS OF BRITISH COLUMBIA—Continued.

Years.	Total by species.						Grand total.
	Chum.	Coho, or silver.	Spring, or king.	Humpback.	Sockeye.	Steelhead trout.	
1885					1,800,000		1,800,000
1886					2,625,000		2,625,000
1887					4,414,000		4,414,000
1888					5,807,000		5,807,000
1889					4,419,000		4,419,000
1890					6,640,000		6,640,000
1891					3,603,800		3,603,800
1892					6,000,000		6,000,000
1893					5,674,000		5,674,000
1894					6,300,000		6,300,000
1895					6,390,000		6,390,000
1896					10,393,000		10,393,000
1897					5,928,000		5,928,000
1898					5,850,000		5,850,000
1899					4,742,000		4,742,000
1900					6,200,000		6,200,000
1902		98,000			15,800,000	75,000	15,973,000
1903	75,000	1,750,000	22,000		17,607,000		19,454,000
1904		210,000		50,000	20,225,200	12,000	20,497,200
1905		5,576,100	4,381,400		15,862,200		25,819,700
1906		4,774,000	1,791,500		117,136,850	4,000	123,706,350
1907		3,219,200	1,814,900		54,401,650		59,435,750
1908		5,830,000	7,581,000	22,500,000	74,196,150		110,107,150
1909		7,375,400	5,772,400		71,591,900		84,739,700
1910		450,000	6,300,000		134,630,200		141,380,200
1911	40,000	9,868,800	2,554,500		62,414,770	145,200	75,023,270
1912		7,367,000	6,418,500	28,773,350	77,077,570	37,200	119,698,620
1913	1,100,000	5,175,600	5,246,050		83,486,880	173,900	95,182,430
1914		3,744,000	751,000	500,000	135,915,700	87,200	141,997,900
1915	125,000	4,425,220	2,865,300	16,000	72,898,613	55,000	80,385,133
Total	1,340,000	59,985,220	45,438,580	51,839,350	1,041,047,483	589,500	1,233,190,323

ALASKA.

In 1891 several of the canneries operating at Karluk, on Kodiak Island, combined forces and built a hatchery on the lagoon at that place. As the cannery men were at swords' points in regard to their fishing rights on the spit, in 1892 the hatchery was closed. In May, 1896, the Alaska Packers Association broke ground for a hatchery at the eastern end of the lagoon, near the outlet of Karluk River, a short distance from where the hatchery was located in 1891, and operated it until 1916, when it was closed temporarily.

In 1892 Capt. John C. Callbreath, manager of the Point Ellis cannery, on Kuiu Island, operated a small hatchery on the left bank of Kutlakoo stream. It was a very primitive place, and an exceptionally high tide destroyed the whole plant in September. It was never rebuilt.

Capt. Callbreath, however, after seeing to the operation of the hatchery, had returned to Wrangell during the summer, where his attention was again attracted to hatchery work, and in the fall of 1892 he built a small hatchery on Jadjeska stream, Etolin Island, about 200 yards from its mouth. The stream is about one-half mile in length and is the outlet of a small lake. Finding the location unsuitable Capt. Callbreath removed the hatchery in 1893 to the northern side of the lake, about three-eighths of a mile from the head of the outlet, where it still stands. The owner's intention was to build up a stream which had a small natural run of red salmon until it had a large run, with the hope that the Government would then give him the exclusive right to take these fish from the stream for commercial purposes. The experiment was kept up until the end of the season of 1905, when Capt. Callbreath's failing eyesight compelled the cessation of the actual hatching. Until 1910 a man was stationed on the stream during the run of spawning fish for the purpose of lifting them over the dam, so that they could reach the spawning beds at the head of the lake, and the project was abandoned entirely shortly thereafter. The owner's expectation of a big run as a result of hatching operations was never realized.

In 1896 the Baranof Packing Co., which operated a cannery on Redfish Bay, on the western coast of Baranof Island, built a small hatchery on the lake at the head of Redfish stream. The following winter was so cold that not only the flume, but the whole cataract, froze solid, and as the hatchery was thus left without water the eggs were put into the lake and left to their fate and the hatchery closed down permanently.

In 1897 the North Pacific Trading & Packing Co., at Klawak, Prince of Wales Island, established a hatchery near the head of Klawak stream, close to Klawak Lake. In 1898 the plant was moved to the mouth of a small stream entering the lake about halfway up the western shore. This hatchery has been operated continuously ever since. In 1909 the North Alaska Salmon Co. acquired a half interest in it, which it relinquished to the original owners a few years later.

The Pacific Steam Whaling Co., in 1898 erected a small hatchery on Hetta Lake, on the west side of Prince of Wales Island, which was operated until the close of the hatching season of 1903–4, when the Pacific Packing & Navigation Co., successor to the original owner, went into the hands of a receiver. In 1907 it was reopened by the Northwestern Fisheries Co., which had acquired the interests of the old company, and has been operated each season since.

Up to 1900 the work of hatching salmon was entirely voluntary on the part of the packers. On May 2 of that year the following regulation was promulgated at the Treasury Department, which at that time had control of the Alaska salmon-inspection service:

> 7. Each person, company, or corporation taking salmon in Alaskan waters shall establish and conduct, at or near the fisheries operated by him or them, a suitable artificial propagating plant or hatchery; and shall produce yearly and place in the natural spawning waters of each fishery so operated red-salmon fry in such numbers as shall be equal to at least four times the number of mature fish taken from the said fisheries, by or for him or them, during the preceding fishing season. The management and operation of such hatcheries shall be subject to such rules and regulations as may hereafter be prescribed by the Secretary of the Treasury. They shall be open for inspection by the authorized official of this department; annual reports shall be made, giving full particulars of the number of male and female salmon stripped, the number of eggs treated, the number and percentage of fish hatched, and all other conditions of interest; and there shall be made a sworn yearly statement of the number of fry planted and the exact location where said planting was done.

On January 24, 1902, this regulation was amended so as to require the planting of "red-salmon fry in such numbers as shall be equal to at least ten times the number of salmon of all varieties taken from the said fisheries."

Although the regulation was mandatory, but few of the packers obeyed it, some because no suitable place was to be found within a reasonable distance of their plants, others because the establishment and operation of such a hatchery would cost more than their returns from the industry justified, and others because of lack of knowledge required in hatchery work. The greater number of them absolutely ignored it, and as a result those who conformed to the regulation were placed under a heavy financial handicap. The injustice of this arrangement was patent on its face, and in 1906, when a comprehensive revision of the law was made by Congress, provision was made for reimbursing in the future those cannery men who operated salmon hatcheries. The section covering this point reads as follows:

> SEC. 2. That the catch and pack of salmon made in Alaska by the owners of private salmon hatcheries operated in Alaska shall be exempt from all license fees and taxation of every nature at the rate of ten cases of canned salmon to every one thousand red or king salmon fry liberated, upon the following conditions.

That the Secretary of Commerce and Labor may from time to time, and on the application of the hatchery owner shall, within a reasonable time thereafter, cause such private hatcheries to be inspected for the purpose of determining the character of their operations, efficiency, and productiveness, and if he approve the same shall cause notice of such approval to be filed in the office of the clerk or deputy clerk of the United States district court of the division of the District of Alaska wherein any such hatchery is located, and shall also notify the owners of such hatchery of the action taken by him. The owner, agent, officer, or superintendent of any hatchery the effectiveness and productiveness of which has been approved as above provided shall, between the thirtieth day of June and the thirty-first day of December of each year, make proof of the number of salmon fry liberated during the twelve months immediately preceding the thirtieth day of June, by a written statement under oath. Such proof shall be filed in the office of the clerk or deputy clerk of the United States district court of the division of the District of Alaska wherein such hatchery is located, and when so filed shall entitle the respective hatchery owners to the exemption as herein provided; and a false oath as to the number of salmon fry liberated shall be deemed perjury and subject the offender to all the pains and penalties thereof. Duplicates of such statements shall also be filed with the Secretary of Commerce and Labor.

It shall be the duty of such clerk or deputy clerk in whose office the approval and proof heretofore provided for are filed to forthwith issue to the hatchery owner, causing such proofs to be filed, certificates which shall not be transferable and of such denominations as said owner may request (no certificate to cover fewer than one thousand fry), covering in the aggregate the number of fry so proved to have been liberated; and such certificates may be used at any time by the person, company, corporation, or association to whom issued for the payment pro tanto of any license fees or taxes upon or against or on account of any catch or pack of salmon made by them in Alaska; and it shall be the duty of all public officials charged with the duty of collecting or receiving such license fees or taxes to accept such certificates in lieu of money in payment of all license fees or taxes upon or against the pack of canned salmon at the ratio of one thousand fry for each ten cases of salmon. No hatchery owner shall obtain the rebates from the output of any hatchery to which he might otherwise be entitled under this act unless the efficiency of said hatchery has first been approved by the Secretary of Commerce and Labor in the manner herein provided for.

Of recent years so much objection has been raised to the system of hatchery rebates that the matter of the Federal Government taking over all private hatcheries in Alaska, at a fair valuation, and operating same, is being favorably considered.

In 1901 the Pacific Steam Whaling Co. established two small hatcheries—one on Nagel Stream, which enters the northern side of Quadra Lake, on the mainland of southeast Alaska, and one on a stream entering Freshwater Lake Bay, Chatham Strait. Both were closed down in 1904 when the company failed. In 1908 the Northwestern Fisheries Co., which had acquired the Quadra plant, removed it to a small stream entering the head of the lake and has operated it ever since.

In 1901 the Alaska Packers Association erected a hatchery on Heckman Lake, the third of a series of lakes on Naha Stream, Revillagigedo Island, and about 8 miles from Loring, where the association has a cannery. This is without question the largest and costliest salmon hatchery in the world, having a capacity of 110,000,000 eggs, and the association is entitled to great credit for the public spirit it has shown and the work it has done, entirely without remuneration until 1906, in building and operating not only this hatchery but also the one at Karluk.

The Union Packing Co., at Kell Bay, on Kuiu Island, and F. C. Barnes, at Lake Bay, on Prince of Wales Island, in 1902 built and operated small hatcheries, both of which were abandoned after one season's work.

Up to 1905 the work of hatching salmon in Alaska was confined to the salmon cannery men. In that year, however, the United States Bureau of Fisheries erected a hatchery on Yes Lake, which empties through a short stream into Yes Bay, on Cleveland Peninsula. In 1907 the bureau constructed another hatchery, on Afognak Lake, near Litnik Bay, Afognak Island.

The eruption of Katmai Volcano, on the Alaska Peninsula, June 6, 1912, covered the island of Afognak with volcanic ash and sand to an average depth of 9 inches. It is estimated that 20,000 salmon perished at the head of Litnik Lake, while thousands were driven back into the ocean. As a result of these conditions the work at the Afognak station was much hampered and curtailed. Even as late as 1915 work at this station was still being hampered by the volcanic ash and sand which fell in 1912.

In 1913 collecting stations were established at Eagle Harbor and Uganak Lake, on Kodiak Island. In 1915 another was established at Seal Bay, on Afognak Island.

In 1913 a collecting station was established on Ketchikan Creek, but, owing to the objections of the citizens of the town against the taking away of the eggs, the station was abandoned in 1915.

The following tables show the eggs gathered and the fry planted by the Government and privately owned hatcheries in Alaska:

OUTPUT OF THE SALMON HATCHERIES IN ALASKA OWNED BY THE UNITED STATES BUREAU OF FISHERIES, 1906 TO 1915.

Year ending June 30—	Yes Lake hatchery.							
	Red, or sockeye.		Coho, or silver, fry.	Steelhead fry.	Humpback.		Total.	
	Eggs.	Fry.			Eggs.	Fry.	Eggs.	Fry.
1906		6,638,550						6,638,550
1907		54,610,800		143,500				54,754,300
1908		61,360,000						61,360,000
1909		48,653,000	9,900					48,662,900
1910		69,579,600						69,579,600
1911		68,239,900			100,000		100,000	68,239,900
1912		68,335,000						68,335,000
1913		60,422,100						60,422,100
1914	2,000,000	42,726,400				4,500,000	2,000,000	47,226,400
1915		[a] 37,445,000			2,000,000		2,000,000	37,445,000
Total	2,000,000	518,319,350	9,900	143,500	2,100,000	4,500,000	4,100,000	522,972,750

[a] Includes 3,925,000 fingerlings, yearlings, or adults.

OUTPUT OF THE SALMON HATCHERIES IN ALASKA, OWNED BY THE UNITED STATES BUREAU OF FISHERIES, 1906 TO 1915—Continued.

Year ending June 30—	Afognak hatchery.						
	Red, or sockeye.		Coho, or silver, fry.	Humpback.		Total.	
	Eggs.	Fry.		Eggs.	Fry.	Eggs.	Fry.
1909	....	39,325,870	....	....	10,000	....	39,335,870
1910	....	71,647,170	....	....	363,740	....	72,010,910
1911	....	26,755,000	....	....	364,150	....	27,119,150
1912	....	18,394,700	....	3,271,740	....	3,271,740	18,394,700
1913	....	12,551,100	....	....	....	....	12,551,100
1914	3,970,000	7,761,705	50,000	....	12,084,399	3,970,000	19,846,104
1915	....	[a] 6,387,080	....	12,500,000	[b] 343,480	12,500,000	6,730,560
Total	3,970,000	182,822,625	50,000	15,771,740	13,115,769	19,741,740	195,988,394

Year ending June 30—	Total, by species.						Grand total.	
	Red, or sockeye.		Coho, or silver, fry.	Steelhead fry.	Humpback.			
	Eggs.	Fry.			Eggs.	Fry.	Eggs.	Fry.
1906	....	6,638,550	....	....	....	....	....	6,638,550
1907	....	54,610,800	....	143,500	....	....	....	54,754,300
1908	....	61,369,000	....	....	....	....	....	61,369,000
1909	....	87,978,870	9,900	....	....	10,000	....	87,998,770
1910	....	141,526,770	....	....	....	363,740	....	141,890,510
1911	....	94,994,900	....	....	100,000	364,150	100,000	95,359,050
1912	....	86,729,700	....	....	3,271,740	....	3,271,740	86,729,700
1913	....	72,973,200	....	....	....	....	....	72,973,200
1914	5,970,000	50,488,105	50,000	....	....	16,534,399	5,970,000	67,072,504
1915	....	[c] 43,832,080	....	....	14,500,000	[d] 343,480	14,500,000	[e] 44,175,560
Total	5,970,000	701,141,975	59,900	143,500	17,871,740	17,615,769	23,841,740	718,961,144

[a] Includes 5,444,830 fingerlings, yearlings, or adults.
[b] Includes 119,480 fingerlings, yearlings, or adults.
[c] Includes 8,360,830 fingerlings, yearlings, or adults.
[d] Includes 119,480 fingerlings, yearlings, or adults.
[e] Includes 8,480,310 fingerlings, yearlings, or adults.

OUTPUT OF PRIVATE SALMON HATCHERIES OF ALASKA, 1893 TO 1915.

[Unless otherwise stated in footnotes, all of the fry liberated were red salmon.]

Year ended June 30—	Callbreath's hatchery.		Karluk hatchery.		Klawak hatchery.	
	Eggs.	Fry.	Eggs.	Fry.	Eggs.	Fry.
1893	900,000	600,000				
1894	3,000,000	2,204,000				
1895	6,300,000	5,291,000				
1896	6,200,000	5,475,000				
1897	4,400,000	4,390,000	3,236,000	2,556,440		
1898	3,400,000	2,526,000	8,454,000	6,340,000	2,023,000	800,000
1899	3,000,000	2,050,000	4,491,000	3,369,000	3,600,000	3,000,000
1900	3,400,000	2,335,000	10,496,900	7,872,000	3,600,000	a 1,000,000
1901	(b)		19,334,000	15,506,800	(c)	
1902	6,000,000	5,500,000	32,800,000	28,700,000	3,500,000	2,800,000
1903	6,000,000	5,000,000	23,400,000	17,555,000	3,500,000	1,500,000
1904	6,000,000	5,000,000	28,113,000	22,000,000	3,000,000	1,700,000
1905	6,050,000	5,250,000	45,500,000	33,670,000	2,800,000	2,000,000
1906	7,700,000	6,500,000	36,933,000	28,236,412	2,800,000	2,300,000
1907	(d)	(d)	38,679,200	36,846,000	3,600,000	1,187,000
1908	(e)	(e)	47,808,200	43,655,000	3,500,000	2,776,000
1909	(e)	(e)	40,320,000	37,105,000	3,500,000	3,200,000
1910	(e)	(e)	45,228,000	40,620,000	5,800,000	5,300,000
1911	(e)	(e)	49,626,000	37,722,000	6,786,500	6,200,000
1912			41,026,800	37,495,100	5,000,000	3,530,000
1913			45,600,000	41,803,155	3,835,000	3,675,000
1914			34,629,160	31,546,080	3,645,000	3,465,000
1915			f 30,240,000	27,704,000	3,816,000	3,653,000
Total	g 63,350,000	52,121,000	585,915,260	500,361,987	64,905,500	48,086,000

Year ended June 30—	Hetta hatchery.		Quadra Bay hatchery.		Freshwater Bay hatchery.	
	Eggs.	Fry.	Eggs.	Fry.	Eggs.	Fry.
1893						
1894						
1895						
1896						
1897						
1898						
1899	2,800,000	2,600,000				
1900	2,000,000	1,500,000				
1901	1,800,000	a 500,000				
1902	2,500,000	1,700,000	4,500,000	3,500,000	1,500,000	1,000,000
1903	4,800,000	4,000,000	5,500,000	4,000,000	(b)	(b)
1904	5,127,500	3,750,000	600,000	c 400,000	(d)	(d)
1905	(h)	(h)	(h)	(h)	(h)	(h)
1906	(h)	(h)	(h)	(h)	(h)	(h)
1907	(h)	(h)	(h)	(h)	(h)	(h)
1908	8,000,000	6,125,000	(h)	(h)	(h)	(h)
1909	8,400,000	8,134,000	3,325,000	3,025,750	(h)	(h)
1910	10,313,000	9,000,000	10,863,000	9,[illegible],000	(h)	(h)
1911	9,141,000	8,552,500	11,200,000	10,3[illegible],000	(h)	(h)
1912	2,585,000	2,342,000	11,000,000	10,166,000	(h)	(h)
1913	3,780,000	3,592,000	10,000,000	8,127,000	(h)	(h)
1914	4,082,000	3,590,500	18,400,000	17,054,000	(h)	(h)
1915	7,438,500	7,142,500	21,300,000	20,300,000	(h)	(h)
Total	72,767,000	62,528,500	96,688,000	86,772,750	1,500,000	1,000,000

a Many eggs frozen.
b No run of fish.
c Hatchery was not used, the eggs being hatched out in the lake.
d No report.
e Fish coming in to spawn were lifted over the dam.
f A collection of 7,400,000 humpback eggs was made for Afognak, and these appear in the report of that hatchery.
g A considerable proportion of these are coho eggs.
h Not operated.

OUTPUT OF PRIVATE SALMON HATCHERIES OF ALASKA, 1893 TO 1915—Continued.

Year ended June 30—	Fortmann hatchery.		Kell Bay hatchery.		Total.	
	Eggs.	Fry.	Eggs.	Fry.	Eggs.	Fry.
1893					900,000	600,000
1894					3,000,000	2,204,000
1895					6,300,000	5,391,000
1896					6,200,000	5,475,000
1897					8,636,000	6,946,440
1898					13,877,000	9,666,000
1899					13,891,000	11,019,000
1900					19,496,900	12,707,000
1901					21,134,000	16,066,800
1902	11,460,000	10,300,000			62,260,000	53,500,000
1903	40,050,000	29,005,000	2,500,000	2,000,000	85,750,000	63,060,000
1904	22,203,000	13,780,000	(a)	(a)	65,043,500	46,630,000
1905	65,010,000	63,181,000	(a)	(a)	119,360,000	104,101,000
1906	66,715,000	67,643,000	(a)	(a)	116,146,000	104,679,412
1907	105,450,000	80,973,000	(a)	(a)	147,729,200	119,006,000
1908	[b] 41,290,000	33,920,000	(a)	(a)	100,588,200	86,476,000
1909	24,465,000	22,785,000	(a)	(a)	80,010,000	74,249,750
1910	53,340,000	50,726,000	(a)	(a)	125,544,000	115,495,000
1911	34,920,000	30,245,000	(a)	(a)	111,673,500	93,069,500
1912	107,520,000	100,335,000	(a)	(a)	167,731,800	153,906,100
1913	23,160,000	20,800,000	(a)	(a)	86,375,000	77,997,155
1914	9,480,000	8,700,000	(a)	(a)	70,296,160	64,355,560
1915	22,500,000	20,820,000	(a)	(a)	85,294,500	79,619,500
Total	629.553,000	553,212,000	2,500,000	2,000,000	1,517,176,760	1,306,082,227

[a] Not operated.

[b] Includes 30,000 coho eggs taken and 27,000 fry liberated.